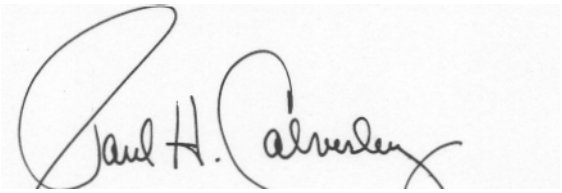
# Foreword

This soil survey contains information that can be used in land-planning programs in Fremont County, Western Part. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



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# Soil Survey of
# Fremont County, Idaho, Western Part

By Ray Grow, Soil Conservation Service

Fieldwork by Ray Grow, Tom Hahn, Lex Riggle, Ken Adams, Jim Dorr, and Wendell Jorgensen, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with
United States Department of the Interior, Bureau of Land Management; University of Idaho, College of Agriculture; and Idaho Soil Conservation Commission

This survey area is in the eastern part of Idaho (fig. 1). It consists of nearly all of Fremont County, except for the parts that are in the Targhee National Forest and Harriman State Park. The total acreage of the survey area is 654,972 acres, or about 1,023 square miles. St. Anthony, the county seat, had a population of about 2,900 in 1988.

The survey area consists mainly of basalt plains, stream terraces, and outwash plains. The basalt plains are west of the Henrys Fork of the Snake River and the Island Park Caldera. The stream terraces are on both sides of the Henrys Fork, near St. Anthony and in the Henrys Lake area. The outwash plains and stream terraces are in the open areas of Island Park Siding and Trude Siding. The Henrys Fork originates in the northern part of the survey area and exits the area in the southwestern part. The Island Park Caldera is in the center of the county. Small mountainous areas are north of the Island Park Reservoir and on three sides of Henrys Lake.

The lowest point in the survey area, which is at an elevation of about 4,830 feet, is in the southwestern part of the county, at Henrys Lake. The highest point, which is at an elevation of about 8,400 feet, is north of Henrys Lake.

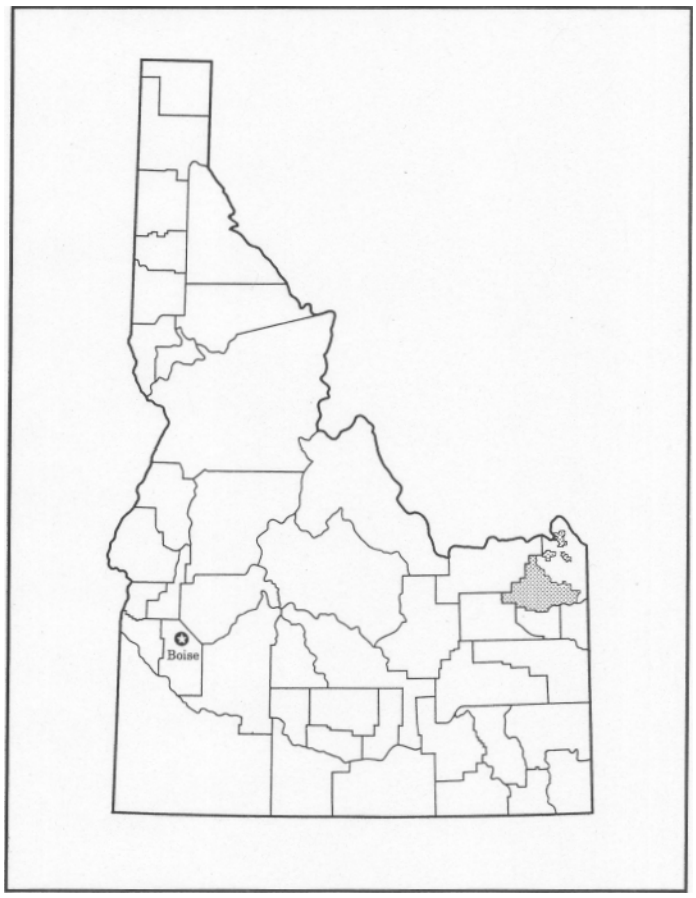


**Figure 1.-Location of Fremont County, Western Part, in Idaho.**

## General Nature of the Survey Area

This section gives general information about the survey area. It describes history and development, natural resources, farming, and climate.

## History and Development

Pete Valora, Department of Geography, Ricks College, helped prepare this section.

Fremont County was the site of the first American "fort," or trading post, west of the Rocky Mountains. The fort was established in 1810 by Andrew Henry and his small troop of men from the Missouri Fur Company.

In the fall of 1811, the overland Astorians led by Wilson Price Hunt set out en route to the mouth of the Columbia River. Their disastrous attempt to float to the mouth of the river is a tale of survival in the settlement of the West.

The impetus for permanent settlement of the survey area was the construction of the Utah and Northern Railroad, extending from Logan, Utah, to mining towns in Montana. John Poole, a laborer on the railroad, was impressed with the potential of the land around the Upper Forks of the Snake River. Within a few years, much of the best farmland in this area was claimed and communities were under construction.

In 1879, Eginbench, which is about 7 miles southwest of the present site of St. Anthony, became the first community in the area. It was soon discovered that subirrigation was best suited to the sandy, stream-deposited material in this area. By 1886, the Egin Canal was completed. It provided water for the largest subirrigated tract of cropland in the world. Much of this land is now irrigated by sprinklers.

In 1890, C.H. Moon built the first cabin at St. Anthony. He named the community after St. Anthony Falls in Minnesota because it resembled a portion of the Henrys Fork of the Snake River near his cabin.

Fremont County was organized in March 1893. St. Anthony became the county seat because of its favorable location as a commercial center. The county originally also included Madison, Jefferson, Teton, and Clark Counties. In 1910, Fremont County was selected as a site for an experiment in producing peas for seed. This experiment provided the agricultural foundation for the county.

Ashton was established in 1904. It was named after William Ashton, the chief engineer of railroad construction for the Oregon Shortline Railroad. A desire to buy land, the production of grain, and the construction of the railroad were some of the most influential factors in the development of northern Fremont County.

Other communities that were established as a result of the demand for land ownership were Marysville, Greentimber, Drummond, France, and Lamont. These communities are in highly productive areas where barley, wheat, and seed potatoes are grown.

Still other communities developed as the county prospered. These include Chester and Twin Groves, which are east of St. Anthony; Wilford, Teton, and Newdale, which are to the south; and Parker, which is to the west.

## Natural Resources

The primary natural resources in the survey area are soil and water. Most of the jobs in the area are dependent on these resources.

Surface water is used primarily for irrigation and livestock. Well water is used mainly for domestic purposes and for crops, but a small percentage also is used for livestock. Subsurface water drains from the higher elevations in the northern part of the survey area to the lower elevations in the southern part. The main streams in the Ashton area are the Henrys Fork of the Snake River, Conant Creek, Squirrel Creek, Robinson Creek, and the Falls River. Henrys Fork is the only major stream in the St. Anthony area (16).

The soils in the southern and eastern parts of the survey area are suited to farming. Some of the most fragile cropland is in the areas of deep loess east of the Henrys Fork of the Snake River. The soils in these areas are easily eroded during spring runoff and summer rainstorms. The sandy soils in the southwestern part of the county also are fragile. They are subject to wind erosion when the vegetation is removed.

Sand, gravel, and cinders are quarried for use in roadbeds and as construction material. The gravelly stream terraces along Henrys Fork provide most of the sand and gravel in the area. Cinders, which are suitable for use in roadbeds, are mined in a few small areas.

## Farming

Small grain and hay, including native grasses and alfalfa, are the chief crops grown in the survey area. Farmers have grown a variety of small grains in a continuing search for viable crops, but wheat and barley are dominant. Tender fruit does not grow well because of the harsh climate in the survey area.

Other crops have been grown to supplement the income from hay and grain. For a time both sugar beets and peas were cultivated in the survey area. Both offered a fair cash return, but the production of beets was restricted by a short growing season and the production of peas was restricted by disease and harvesting problems. Sunflowers and lentils may be suitable, but marketing these crops is a concern.

Potatoes have become the dominant cash crop in the survey area. Potatoes for processing or fresh packing are grown in the area south of Ashton. The area in

Idaho best suited to the production of seed potatoes is north and east of Ashton. The seed potatoes grown in this area are shipped throughout the West.

Most of the land in the survey area is used as range. The area has been used for ranching since before the first acre was plowed for crops in 1879. The Yellowstone Soil Conservation District coordinates the management of federal, state, and private lands in Fremont County. It was organized on August 3, 1944. Its main goal is to control wind erosion and water erosion in the county (7).

## Climate

In the relatively flat agricultural areas of Fremont County, summers are mild and winters are cold. The climate of the main agricultural region is characterized by data recorded at Ashton, and that of the much smaller, colder region in the northeastern part of the survey area is characterized by data recorded at Island Park.

Precipitation peaks in December and January, when more than 4 inches is received at Island Park and slightly more than 2 inches is received at Ashton. The monthly total generally decreases throughout the year, but there is a secondary peak in May and June before the annual low in July.

Table 1 gives data on temperature and precipitation for the survey area as recorded at in the period 1948 to 1990 at Ashton, Island Park, and St. Anthony. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In January the average temperature is about 18 degrees F at Ashton and St. Anthony and 14 degrees at Island Park. The lowest temperature on record, which occurred at Island Park, is minus 60 degrees. In July, the average temperature is about 65 degrees at Ashton and 60 degrees at Island Park and the average daily maximum temperature is about 83 degrees at Ashton and 78 degrees at Island Park. The highest recorded temperature, which occurred at St. Anthony, is 100 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 14 inches at St. Anthony, 20 inches at Ashton, and 37 inches at Island Park. Of the total, about 44 percent usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 6 inches. The heaviest 1-day rainfall during the period of record was 1.78 inches at Ashton on July 17, 1967. Thunderstorms occur on about 30 days each year, and most occur in spring and summer.

The average seasonal snowfall is about 36 inches at St. Anthony, 92 inches at Ashton, and 222 inches at Island Park. The greatest snow depth at any one time during the period of record was 52 inches at Ashton on March 4, 1979, and 87 inches at Island Park in March 1952.

The average relative humidity in midafternoon is about 15 percent in July and 75 percent in January. Humidity is higher at night, and the average at dawn is about 40 percent in July and 70 percent in January. The sun shines 75 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the southwest most of the year, but northeasterly winds are common in December and January. Average windspeed is highest, 10 miles per hour, in April.

# How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Color infrared, high-altitude aerial photography and video image analysis were used to identify and quantify land surface features important to map unit composition in the parts of the survey area used for range. Investigation on the ground revealed that changes in vegetation, the presence or absence of rock outcrops, and variations in the roughness of the land surface were important indicators in mapping the soils. These features were identified on the aerial photographs as changes in color, tone, contrast, and pattern. Soil scientists scanned portions of the aerial photographs with a computer-based video image analyzer to identify and measure these features. Merging this information with transect data collected on the ground enabled the soil scientists to make a more accurate determination of the extent of the soils (12).

# General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land use. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

## Map Unit Descriptions

**1. St. Anthony-Allwit-Eginbench**

Very deep, nearly level and gently sloping, well drained, somewhat poorly drained, and poorly drained soils formed in alluvium

Percentage of survey area: 12
Position on landscape: St. Anthony soils-stream terraces; Allwit soils-low-lying. areas on stream terraces; Eginbench soils-stream terraces covered with eolian sand
Elevation: 4,900 to 5,000 feet
Frost-free period: 90 to 100 days
Average annual precipitation: About 13 inches
Minor components: Labenzo, Nayrib, Engett, Blacksan, and Sandcreek soils; Fluvaquents
Present uses: Irrigated wheat, barley, hay, potatoes, and pasture; homesites; urban development

**2. Fourme-Raynoldson-Trude**

Very deep, nearly level to strongly sloping, very cold, well drained soils formed in alluvium

Percentage of survey area: 6
Position on landscape: Fourme soils-terraces; Raynoldson soils-outwash plains, fan terraces; Trude soils-outwash plains, stream terraces
Elevation: 6,300 to 6,700 feet
Frost-free period: 40 to 45 days
Average annual precipitation: About 25 inches
Minor components: Bootjack, Sawtelpeak, Stamp, Chickreek, Targhee, and Tepete soils
Present uses: Recreational development, rangeland, wildlife habitat, irrigated pasture, homesites

**3. Bootjack-Chickreek**

Very deep, nearly level, very cold, poorly drained soils formed in alluvium

Percentage of survey area: 2
Position on landscape: Bootjack and Chickreek soils broad, low-lying basins on flood plains and stream terraces
Elevation: 6,300 to 7,000 feet
Frost-free period: 40 to 45 days
Average annual precipitation: About 27 inches
Minor components: Stamp, Tepete, Targhee, and Trude soils
Present uses: Pasture, rangeland, recreational development, homesites, wildlife habitat

**4. Shotgun-Fourme-Henryslake**

Moderately deep and very deep, nearly level and gently sloping, very cold, well drained and poorly drained soils formed in loess and alluvium

Percentage of survey area: 7
Position on landscape: Shotgun soils-loess-covered

**Figure 2.-Typical area of the Marystown-Robinlee-Greentimber general soil map unit. The topography is a result of glaciers that moved from northeast to southwest.**

basalt plains; Fourme soils-fan terraces; Henryslake soils-outwash plains
Elevation: 6,400 to 6,500 feet
Frost-free period: 40 to 50 days
Average annual precipitation: About 25 inches
Minor components: Spliten, Bootjack, Judkins, Targhee, Sudpeak, and Stringam soils
Present uses: Rangeland, wildlife habitat, homesites, recreational development, pasture

**5. Marystown-Robinlee-Greentimber**

Very deep, nearly level to moderately steep, well drained soils formed in loess underlain by glacial deposits

Percentage of survey area: 4
Position on landscape: Marystown, Robinlee, and Greentimber soils-loess-covered plains and moraines (fig. 2)
Elevation: 5,300 to 5,600 feet
Frost-free period: 75 to 85 days
Average annual precipitation: About 18 inches
Minor components: Lostine, Rin, and Greys soils
Present uses: Irrigated and nonirrigated crops, pasture, homesites

**6. Rexburg-Ririe-Kucera**

Deep and very deep, nearly level to moderately steep, well drained soils formed in loess

Percentage of survey area: 13
Position on landscape: Rexburg and Ririe soils-loess covered foothills and plains; Ririe soils-loess covered plains
Elevation: 5,200 to 5,300 feet
Frost-free period: 80 to 95 days
Average annual precipitation: About 16 inches
Minor components: Sarilda, Sadorus, Lostine, Jipper, Stipe, Nayrib, Targhee, and Lavacreek soils; Rock outcrop

Present uses: Irrigated and nonirrigated crops, homesites, urban development

**7. Rin-Tetonia-Greys**

Very deep, nearly level to moderately steep, very cold, well drained soils formed in loess

Percentage of survey area: 6
Position on landscape: Rin soils-north- and east-facing slopes in the foothills; Tetonia soils-south- and west-facing slopes in the foothills; Greys soils-all areas in the foothills
Elevation: 5,700 to 6,050 feet
Frost-free period: 60 to 70 days
Average annual precipitation: About 18 inches
Minor components: Lantonia, Targhee, and Turnerville soils; Rock outcrop
Present uses: Irrigated and nonirrigated crops, wildlife habitat

**8. Juniperbute-Dune Land-Wolverine**

Dune land and deep and very deep, nearly level to steep, excessively drained soils formed in eolian material

Percentage of survey area: 12
Position on landscape: Juniperbute soils-interridge areas on basalt plains covered with eolian sand; Dune land and Wolverine soils-all areas on basalt plains covered with eolian sand
Elevation: 5,000 to 5,650 feet
Frost-free period: 80 to 95 days
Average annual precipitation: About 13 inches
Minor components: Grassyridge soils; Rock outcrop; Siddoway, Jipper, Stipe, and Nayrib soils
Present uses: Rangeland, wildlife habitat, irrigated crops

**9. Jipper-Grassyridge-Maim**

Moderately deep to very deep, nearly level to moderately steep, well drained and somewhat excessively drained soils formed in eolian material

Percentage of survey area: 10
Position on landscape: Jipper and Maim soils-all areas on sand-covered basalt plains; Grassyridge soils concave and convex areas on sand-covered basalt plains
Elevation: 5,000 to 5,425 feet
Frost-free period: 85 to 95 days
Average annual precipitation: About 12 inches
Minor components: Diston, Wolverine, Modkin, Blacknoll, Stipe, and Nayrib soils; Rock outcrop
Present uses: Rangeland, irrigated crops, wildlife habitat

**10. Engett-Jipper-Nayrib**

Very shallow, deep, and very deep, nearly level to moderately sloping, well drained and somewhat excessively drained soils formed in eolian material

Percentage of survey area: 9
Position on landscape: Engett soils-plane and concave areas on basalt plains; Jipper soils-all areas on basalt plains; Nayrib soils-pressure ridges on basalt plains
Elevation: 5,200 to 5,620 feet
Frost-free period: 85 to 95 days
Average annual precipitation: About 16 inches
Minor components: Snowshoe, Stipe, Sadorus, Sarilda, Blacksan, Sandcreek, Rin, Vadnais, and Katseanes soils; Rock outcrop
Present uses: Rangeland, irrigated and nonirrigated crops, wildlife habitat

**11. Katseanes-Vadnais-Rock Outcrop**

Rock outcrop and shallow and moderately deep, nearly level to very steep, well drained soils formed in alluvium (fig. 3)

Percentage of survey area: 18
Position on landscape: Katseanes and Vadnais soils all areas on basalt plains; Rock outcrop-pressure ridges
Elevation: 6,000 to 6,600 feet
Frost-free period: 55 to 65 days
Average annual precipitation: About 18 inches
Minor components: Hagenbarth, Pinebutte, Crystalbutte, Spliten, Booneville, Judkins, and Stringam soils
Present uses: Rangeland, wildlife habitat

**12. Raynoldson-Kitchell-Lionhead**

Very deep, gently sloping to very steep, very cold, well drained soils formed in residuum and alluvium

Percentage of survey area: 1
Position on landscape: Raynoldson soils-fan terraces; Kitchell and Lionhead soils-mountainsides
Elevation: 6,500 to 7,800 feet
Frost-free period: 40 to 50 days
Average annual precipitation: About 25 inches
Minor components: Targhee, Judkins, Fourme, Bootjack, Tepete, and Henryslake soils
Present uses: Rangeland, recreational development, homesites, grazable woodland, wildlife habitat

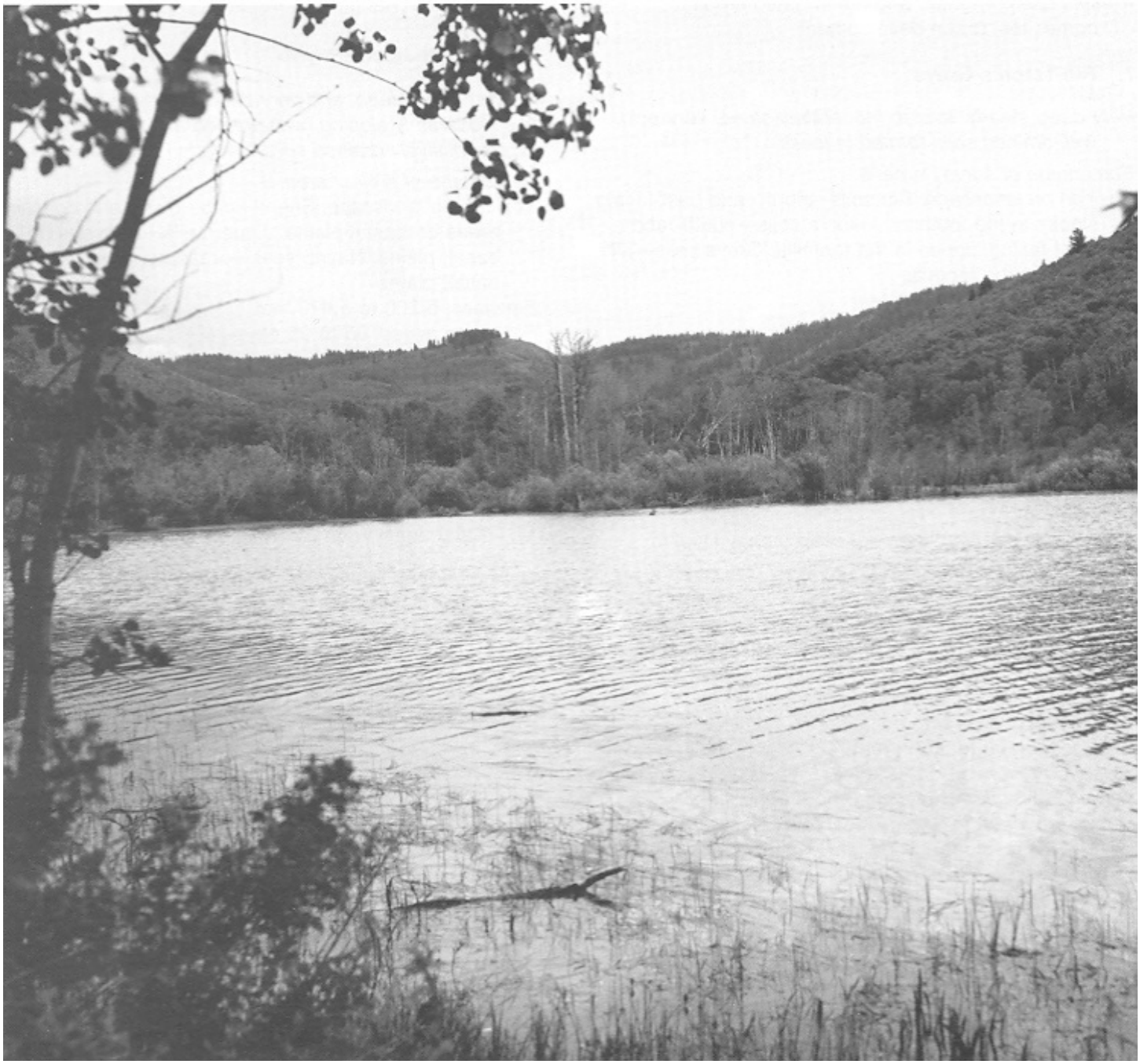

**Figure 3.-Typical area of the Katseanes-Vadnais-Rock outcrop general soil map unit. The Blue Creek Reservoir is in the foreground.**

## Broad Land Use Considerations

Most of the land in the survey area is used as range. Private and state rangeland, some of which is in nearly all of the general soil map units, except for unit 1, makes up almost 20 percent of the survey area. Rangeland administered by the Bureau of Land Management makes up about 21 percent of the survey area. It is dominantly in units 8, 9, 10, and 11, but smaller areas are in the northern part of unit 6 and in the southern part of unit 2. Grazable woodland is included in this acreage. It is mainly along the boundary of the forests in the northern and eastern parts of the survey area.

The rangeland in the survey area is limited mainly by a short growing season and by wetness in spring. All of the soils in the area are saturated during spring runoff. The surface layer in most areas is dry by the middle of June, but it is not dry until July in some low-lying areas in Island Park (units 2, 3, 4, and 11). Most of Shotgun Valley (unit 11) is grazable by June 15. Most of the soils near the western end of the Island Park Reservoir (units 3 and 4) have a high water table throughout the year. These wetter soils usually are grazable by July 1. Livestock are removed from most of the rangeland by October.

Water for livestock is provided by wells and water trucks in the southern part of the survey area and by streams, ponds, and reservoirs in the northern part. The quality of the water is good, and the supply is adequate (16).

Irrigated cropland makes up about 22 percent of the survey area. All of the cropland in unit 1 is irrigated, mainly by sprinkler and subirrigation systems. The northern half of unit 6 and most of unit 5 are irrigated by sprinklers. Areas of the sandy soils in units 9 and 10 are irrigated by center-pivot sprinklers.

The production of irrigated crops is limited mainly by the short growing season and the hazards of wind erosion and water erosion. Cool-season varieties are best suited. The frost-free season ranges from 50 days in the northern part of the survey area to 92 days in the southern part. Wind erosion and the water erosion caused by spring runoff are hazards. Specific information about suitable conservation practices can be obtained from the local office of the Soil Conservation Service.

Nonirrigated cropland is concentrated in the southern half of unit 6, the southern two-thirds of unit 7, and parts of unit 5. It makes up about 15 percent of the survey area. Wind erosion and water erosion are the main hazards.

The conservation practices suited to the soils in the survey area include keeping tillage to a minimum, chiseling, terracing, establishing grassed waterways, and maintaining a permanent plant cover. The dominant crops grown in the survey area include wheat, barley, potatoes, hay, and pasture. Seed potatoes and peas are grown in areas northeast of Ashton.

Urban development in the survey area is minimal. In the Ashton area, the main limitation is the depth to bedrock. In the St. Anthony area, the soils are gravelly and are not well suited to sanitary facilities. Sewage lagoons are limited by a risk of seepage. Septic tank absorption fields that are larger than normal are needed on sites for rural homes in the Egin-Parker area to compensate for inadequate filtration of the effluent. The limitations that affect homesite development in other rural areas are described in the section "Detailed Soil Map Units." Information about waste disposal alternatives is available at the local office of the Department of Health.

Summer homes in the areas of Island Park near streams and depressions (units 2 and 3) are limited by a high water table. In areas of units 2 and 11, the depth to bedrock limits the use of the soils on ridges and knolls as sites for homes. Many of these shallower soils are near streambanks or old igneous flows.

Recreational development is common in all of the units. The soils in units 2-3, and 4 in Island Park have a high water table, which is a limitation on sites for sanitary facilities in campgrounds. In the southern part of the survey area, dustiness is the main problem affecting recreational uses. The dunes in unit 8 are of particular value for use by off-road vehicles.

Very few limitations affect the use of the soils in the survey area for wildlife habitat. Adequate forage and plant cover is available for several species of mammals, birds, and reptiles. More detailed information is provided in the section "Wildlife Habitat."

# Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Marystown silt loam, 1 to 4 percent slopes, is a phase of the Marystown series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Kucera-Lostine silt loams, 0 to 2 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Cryoborolls-Haploxerolls-Rock outcrop association, very steep, is an example.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Dune land is an example.

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. Map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use.

The descriptions, names, and delineations of the soils in this soil survey do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils or miscellaneous areas.

## 1-Allwit gravelly sandy loam, 0 to 2 percent slopes

### Composition

Allwit soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Allwit Soil

Position on landscape: Stream. terraces
Elevation: About 5,000 feet
Average annual air temperature: About 43 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 9 inches-grayish brown gravelly sandy loam
9 to 22 inches-brown very gravelly sandy loam
22 to 60 inches-variegated extremely gravelly sand
Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately rapid
Available water capacity: Low
Potential rooting depth: 60 inches for water-tolerant plants; 0 to 24 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Seasonal high water table: 12 inches above to 24 inches below the surface
Frequency of flooding: Occasional

### Inclusions

St. Anthony gravelly sandy loam (10 percent); Fluvaquents (5 percent); soils that are similar to the Allwit soil but have bedrock at a depth of 40 to 60 inches (5 percent)

### Use and Management

Major use: Pasture
Major management factors: Wetness, flooding
General management considerations:
• Seasonal flooding and wetness limit the period of grazing.
• Wetness limits the production of deep-rooted plants.
• Suitable pasture plants are those that can tolerate periodic inundation and seasonal wetness.

### Capability Classification

Vw, nonirrigated

## 2-Blacknoll fine sandy loam, 1 to 6 percent slopes

### Composition

Blacknoll soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Blacknoll Soil

Position on landscape: Basalt plains
Elevation: About 5,550 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 6 inches-dark brown fine sandy loam

6 to 16 inches-brown and pale brown fine sandy loam
16 to 30 inches-very pale brown very fine sandy loam
30 inches-basalt

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Blacknoll soil but have more than 35 percent coarse fragments throughout (5 percent); Rock outcrop (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, depth to bedrock
Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, arrowleaf balsamroot, mountain big sagebrush
General management considerations:

- Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
- Maintaining an adequate plant cover reduces the risk of erosion.
- Seepage limits the construction of livestock watering ponds and other water impoundments.

### Capability Classification

IVe, nonirrigated

## 3-Blacknoll-Jipper fine sandy loams, 0 to 8 percent slopes

### Composition

Blacknoll soil and similar inclusions-50 percent
Jipper soil and similar inclusions-40 percent
Contrasting inclusions-10 percent

### Characteristics of the Blacknoll Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Slope: 0 to 8 percent
Typical profile:
0 to 10 inches-brown fine sandy loam
10 to 14 inches-brown sandy clay loam
14 to 30 inches-light gray fine sandy loam
30 inches-basalt

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Jipper Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Slope: 1 to 6 percent
Typical profile:
0 to 8 inches-grayish brown fine sandy loam
8 to 21 inches-brown very fine sandy loam
21 to 45 inches-light gray very fine sandy loam
45 inches-basalt

Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Blacknoll and Jipper soils but have a surface layer of loamy fine sand (5 percent); Jipper soils that have bedrock at a depth of more than 60 inches (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, permeability, depth to bedrock in some areas
Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, Letterman needlegrass, arrowleaf balsam root, mountain big sagebrush, antelope bitterbrush
General management considerations:

- Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion.

• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Seepage limits the construction of livestock watering ponds and other water impoundments.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 4-Blacknoll-Nayrib complex, 1 to 6 percent slopes

### Composition

Blacknoll fine sandy loam and similar inclusions-50 percent
Nayrib very cobbly fine sandy loam and similar inclusions-30 percent
Contrasting inclusions-20 percent

### Characteristics of the Blacknoll Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 10 inches-brown fine sandy loam
10 to 14 inches-brown sandy clay loam
14 to 30 inches-light gray fine sandy loam
30 inches-basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Nayrib Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-brown very cobbly fine sandy loam
8 inches-basalt
Depth class: Very shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 6 to 10 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Moderate

### Inclusions

Jipper fine sandy loam and Stipe fine sandy loam (10 percent); Blacknoll soils that have a surface layer of fine sand and have hardpan fragments on the surface (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, available water capacity, depth to bedrock, cobbles in some areas
Dominant vegetation in potential natural plant community:
Bluebunch wheatgrass, Idaho fescue, mountain big sagebrush, antelope bitterbrush, arrowleaf balsamroot
General management considerations:
• Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion and the depth to bedrock.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIs, nonirrigated

## 5-Blacksan-Eginbench-Nayrib complex, 1 to 6 percent slopes

### Composition

Blacksan loamy fine sand and similar inclusions-40 percent
Eginbench loamy fine sand and similar inclusions-20 percent
Nayrib very cobbly fine sandy loam and similar inclusions-20 percent
Contrasting inclusions-20 percent

### Characteristics of the Blacksan Soil

Position on landscape: Basalt plains
Elevation: About 5,040 feet
Slope: 2 to 6 percent
Average annual air temperature: About 43 degrees F

Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 10 inches-dark grayish brown loamy fine sand
10 to 19 inches-dark grayish brown fine sand
19 to 32 inches-brown fine sand
32 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Excessively drained
Permeability: Rapid
Available water capacity: Very low
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Eginbench Soil

Position on landscape: River terraces, basalt plains, depressions
Elevation: About 5,040 feet
Slope: 1 to 2 percent
Average annual air temperature: About 43 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 9 inches-grayish brown and brown loamy fine sand
9 to 23 inches-light brownish gray loamy fine sand
23 to 56 inches-grayish brown loamy fine sand
56 to 60 inches-gray coarse sand
Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe
Depth to the seasonal high water table: 12 to 20 inches

### Characteristics of the Nayrib Soil

Position on landscape: Basalt plains, ridges, depressions
Elevation: About 5,040 feet
Slope: 1 to 2 percent
Average annual air temperature: About 43 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 8 inches-brown very cobbly fine sandy loam
8 inches-vesicular basalt
Depth class: Very shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 6 to 10 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Moderate

### Inclusions

Soils that are similar to the Eginbench soil but have bedrock at a depth of 10 to 40 inches (10 percent); soils that are similar to the Nayrib soil but have bedrock at a depth of 10 to 20 inches (10 percent)

### Use and Management

Major use: Irrigated pasture
Major management factors: Wind erosion, gravel and cobbles in some areas, depth to bedrock in some areas, available water capacity in some areas, wetness in some areas
General management considerations:
• The use of this unit for pasture is limited by the wetness in depressions; the dry, very shallow, very cobbly soils on ridges; the irregular topography; and the hazard of wind erosion.
• Because of the very low available water capacity in some areas, light and frequent applications of irrigation water are essential.
• Overirrigation leaches nutrients and increases wetness in depressions.
• The best suited irrigation method is a sprinkler system.
• Maintaining an adequate plant cover reduces the risk of wind erosion.

### Capability Classification

VIe, nonirrigated; lVe, irrigated

## 6-Blacksan-Engett, bedrock substratum-Sandcreek complex, 1 to 6 percent slopes

### Composition

Blacksan loamy fine sand and similar inclusions-40 percent
Engett fine sand and similar inclusions-25 percent
Sandcreek sand and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Blacksan Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days

Average annual precipitation: About 16 inches
Typical profile:
0 to 10 inches-dark grayish brown loamy fine sand
10 to 19 inches-dark grayish brown fine sand
19 to 32 inches-brown fine sand
32 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Excessively drained
Permeability: Rapid
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Engett Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile.
0 to 4 inches-very dark grayish brown fine sand
4 to 27 inches-dark brown fine sand
27 to 39 inches-yellowish brown fine sand
39 to 45 inches-yellowish brown loamy fine sand
45 inches-vesicular basalt
Depth class: Deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Low
Potential rooting depth: 40 to 60 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Sandcreek Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 13 inches-dark grayish brown sand
13 to 18 inches-brown cobbly sand
18 inches-vesicular basalt
Depth class: Shallow
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Very low
Potential rooting depth: 14 to 20 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Soils that are similar to the Sandcreek soil but are less than 10 inches deep over bedrock and have more than 35 percent coarse fragments throughout (5 percent); Rock outcrop (5 percent); Engett fine sand that has bedrock at a depth of more than 60 inches (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, depth to bedrock in some areas, available water capacity
Dominant vegetation in potential natural plant community:
Antelope bitterbrush, basin big sagebrush, mountain big sagebrush, bluebunch wheatgrass, needleandthread
General management considerations:
• Seeding of suitable species to improve the range is limited by the hazard of wind erosion and the depth to bedrock.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIIe, nonirrigated

## 7-Blacksan-Sandcreek-Rock outcrop complex, 1 to 6 percent slopes

### Composition

Blacksan loamy fine sand and similar inclusions-40 percent
Sandcreek sand and similar inclusions-30 percent
Rock outcrop-15 percent
Contrasting inclusions-15 percent

### Characteristics of the Blacksan Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile.
0 to 10 inches-dark grayish brown loamy fine sand
10 to 19 inches-dark grayish brown fine sand
19 to 32 inches-brown fine sand
32 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Excessively drained
Permeability: Rapid

Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Sandcreek Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 13 inches-dark grayish brown sand
13 to 18 inches-brown cobbly sand
18 inches-vesicular basalt
Depth class: Shallow
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Very low
Potential rooting depth: 14 to 20 inches
Runoff: Slow
Hazard of water erosion: Slight Hazard of wind erosion: Very severe

### Characteristics of the Rock Outcrop

Position on landscape: Basalt plains
Kind of material: Exposed ridges of basalt

### Inclusions

Engett fine sand in concave areas (10 percent); soils that are similar to the Blacksan soil but are fine sandy loam throughout (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, depth to bedrock, available water capacity
Dominant vegetation in potential natural plant community: Antelope bitterbrush, basin big sagebrush, mountain big sagebrush, thickspike wheatgrass, western wheatgrass, bluebunch wheatgrass, needleandthread
General management considerations:

- Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion and the depth to bedrock.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
- Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIIe, nonirrigated

## 8-Booneville-Crystal butte complex, 4 to 20 percent slopes

### Composition

Booneville gravelly loam and similar inclusions-45 percent
Crystalbutte loam and similar inclusions-35 percent
Contrasting inclusions-20 percent

### Characteristics of the Booneville Soil

Position on landscape: Mountainsides
Elevation: About 6,800 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 25 inches
Slope: 10 to 20 percent
Organic mat on surface: 1 inch thick
Typical profile:
0 to 4 inches-dark grayish brown gravelly loam
4 to 21 inches-brown very gravelly sandy clay loam
21 to 60 inches-pale brown extremely gravelly sandy clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Moderate
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Crystalbutte Soil

Position on landscape: Mountainsides
Elevation: About 6,800 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 24 inches
Slope: 4 to 20 percent
Typical profile:
0 to 23 inches-very dark grayish brown loam
23 to 40 inches-dark brown very cobbly clay loam
40 to 60 inches-dark brown very cobbly loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Vadnais loam (5 percent); Katseanes loam (5 percent); soils that are similar to the Booneville and Crystalbutte soils but have stones and boulders on the surface and throughout the profile (10 percent)

## Use and Management

Major uses: Woodland, grazable woodland, rangeland
Major management factors: Boulders, cobbles, and stones in some areas; water erosion; a very short growing season

**Woodland (Booneville soil)**

Common forest overstory plants: Douglas fir
Mean site index for Douglas fir: 67
Estimated average annual production per acre of Douglas fir: About 52 cubic feet from a stand of 60year-old trees
General management considerations:

- Adequately designed road drainage systems reduce the risk of erosion.
- Stones on the surface can interfere with felling, yarding, and other logging activities that involve the use of equipment.

**Grazable understory (Booneville soil)**

Common forest understory plants: Idaho fescue, pine reedgrass, mountain snowberry, heartleaf arnica
Potential annual production of air-dry vegetation: About 1,400 pounds per acre under an open canopy; about 500 pounds per acre under a closed canopy
General management considerations:

- A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

**Rangeland (Crystalbutte soil)**

Dominant vegetation in potential plant community: Idaho fescue, Columbia needlegrass, Nevada bluegrass, slender wheatgrass, bluebunch wheatgrass, arrowleaf balsamroot, geranium, mountain big sagebrush
General management considerations:

- A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Seeding of suitable species to improve the range is limited by the coarse fragments on or near the surface and the small size and irregular shape of the areas.

## Capability Classification

VIe, nonirrigated

# 9-Booneville-Hagenbarth, moist complex, 10 to 50 percent slopes

## Composition

Booneville gravelly loam and similar inclusions-45 percent
Hagenbarth loam and similar inclusions-35 percent
Contrasting inclusions-20 percent

## Characteristics of the Booneville Soil

Position on landscape: Canyonsides
Elevation: About 5,800 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 50 days
Average annual precipitation: About 22 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 4 inches-dark grayish brown gravelly loam
4 to 21 inches-brown very gravelly sandy clay loam
21 to 60 inches-pale brown extremely gravelly sandy clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: High
Runoff: Rapid or very rapid
Hazard of water erosion: Severe or very severe

## Characteristics of the Hagenbarth Soil

Position on landscape: Canyonsides, ridgetops
Elevation: About 5,800 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 50 days
Average annual precipitation: About 22 inches
Organic mat on surface: 1.5 inches thick
Typical profile:
0 to 14 inches-very dark grayish brown and dark brown loam
14 to 35 inches-dark brown and brown gravelly loam
35 to 60 inches-light reddish brown clay loam and clay
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Rapid or very rapid
Hazard of water erosion: Severe or very severe

## Inclusions

Soils that are similar to the Booneville and Hagenbarth soils but have 35 to 60 percent stones throughout (5 percent); Turnerville silt loam (5 percent); Judkins extremely stony loam (5 percent); Rock outcrop (5 percent)

## Use and Management

Major uses: Woodland, grazable woodland
Major management factors: Slope, water erosion, Rock outcrop in some areas, gravel and stones in some

areas, a very short growing season

**Woodland**

Mean site index for Douglas fir: Booneville soil-67
Estimated average annual production per acre of Douglas fir (noncommercial): About 52 cubic feet from a stand of 60-year-old trees
Mean site index for quaking aspen: Hagenbarth soil-69
Estimated average annual production per acre of aspen (noncommercial): About 38 cubic feet from a stand of 100-year-old trees
General management considerations:
• The slope limits the kinds of equipment that can be used in forest management.
• Adequately designed road drainage systems reduce the risk of erosion.

**Grazable understory**

Common forest understory plants: Booneville soil-Idaho fescue, pine reedgrass, mountain snowberry, heartleaf arnica; Hagenbarth soil-pine reedgrass, slender wheatgrass, mountain brome, sticky geranium, groundsel, quaking aspen, Woods rose
Potential annual production of air-dry vegetation: Booneville soil-about 1,400 pounds per acre under an open canopy and 500 pounds per acre under a closed canopy; Hagenbarth soil-about 2,500 pounds per acre under an open canopy and 900 pounds per acre under a closed canopy
General management considerations:
• Achieving a uniform distribution of grazing is difficult in areas where the slope is more than about 30 percent.
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

### Capability Classification

VIe, nonirrigated

## 10-Bootjack silty clay loam, 0 to 1 percent slopes

### Composition

Bootjack soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Bootjack Soil

Position on landscape: Stream terraces, flood plains
Elevation: About 6,350 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 25 inches
Organic mat on surface: 1.5 inches thick
Typical profile:
0 to 4 inches-grayish brown silty clay loam
4 to 23 inches-light gray and very pale brown silt loam and loam
23 to 60 inches-light gray extremely gravelly loamy coarse sand
Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Available water capacity: High
Potential rooting depth: 60 inches for water-tolerant plants; 0 to 18 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Depth to the water table: 0 to 18 inches in spring and early in summer; more than 18 inches during the rest of the year
Frequency of flooding: Frequent

### Inclusions

Henryslake gravelly loam (5 percent); soils that are similar to the Bootjack soil but have less than 65 percent gravel between depths of 10 and 40 inches (5 percent); soils that are similar to the Bootjack soil but have slopes of 2 to 4 percent (5 percent)

### Use and Management

Major uses: Rangeland, building site development Major management factors: Wetness, flooding, frost action, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Kentucky bluegrass, slender wheatgrass, mountain brome, sedge, clover
General management considerations.
• Seeding of suitable species to improve the range is limited by the wetness and the flooding.
• Grazing should be delayed until the soil is adequately drained and is firm enough to withstand trampling by livestock.
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

**Building site development**

General management considerations:
• Onsite sewage disposal systems may be unsuitable because of a risk of polluting the ground water.
• The quality of roadbeds and road surfaces can be adversely affected by flooding, wetness, and frost action.

### Capability Classification

Vw, nonirrigated

## 11-Chickreek mucky peat, 0 to 1 percent slopes

### Composition

Chickreek soil and similar inclusions-90 percent
Contrasting inclusions-10 percent

### Characteristics of the Chickreek Soil

Position on landscape: Flood plains, stream terraces
Elevation: About 6,300 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 29 inches
Typical profile:
0 to 4 inches-dark grayish brown, slightly decomposed fibric material
4 to 7 inches-gray, highly decomposed sapric material
7 to 22 inches-silty clay loam that is light gray in the upper part and white in the lower part
22 to 31 inches-white silty clay loam
31 to 34 inches-light brownish gray sandy loam
34 to 54 inches-variegated sand 54 to 67 inches-variegated extremely gravelly sand
Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: More than 60 inches for water-tolerant plants; 10 to 18 inches for plants that are not water tolerant
Runoff: Very slow
Hazard of water erosion: Slight
Water table. 12 inches above to 18 inches below the surface in spring and early in summer; more than 18 inches below the surface during the rest of the year
Frequency of flooding: Rare

### Inclusions

Soils that are similar to Judkins soils but have an extremely stony surface layer, have less than 35 percent gravel between depths of 10 and 40 inches, and are poorly drained (10 percent)

### Use and Management

Major uses: Woodland, grazable woodland, homesites
Major management factors: Wetness, ponding, frost action, permeability, a very short growing season

**Woodland**

Common forest overstory plants: Lodgepole pine
Mean site index for lodgepole pine: 57
Estimated average annual production per acre of lodgepole pine (noncommercial): About 47 cubic feet from a stand of trees 100 years old

**Grazable understory**

Common forest understory plants: Pine reedgrass, tufted hairgrass, sedge, bearberry, grouse blueberry
Potential annual production of air-dry vegetation: About 1,700 pounds per acre under an open canopy; about 1,000 pounds per acre under a closed canopy
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• The seasonal ponding and wetness limit the period of grazing.
• Windfall is a hazard in some areas.

**Building site development**

General management considerations:
• Septic tank absorption fields can be expected to function poorly because of the wetness and the slow permeability.
• Onsite sewage disposal systems may be unsuitable because of a risk of polluting the ground water.
• Properly designing footings and roads helps to compensate for frost action.

### Capability Classification

Vlw, nonirrigated

## 12-Chickreek mucky peat, ponded, 0 to 1 percent slopes

### Composition

Chickreek soil and similar inclusions-90 percent
Contrasting inclusions-10 percent

### Characteristics of the Chickreek Soil

Position on landscape: Flood plains
Elevation: About 6,300 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 29 inches
Typical profile:
0 to 4 inches-dark grayish brown, slightly decomposed fibric material
4 to 7 inches-gray, highly decomposed sapric material

7 to 22 inches-silty clay loam that is light gray in the upper part and white in the lower part
22 to 31 inches-white silty clay loam
31 to 34 inches-light brownish gray sandy loam
34 to 54 inches-variegated sand
54 to 67 inches-variegated extremely gravelly sand

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 60 inches for water-tolerant plants; 0 to 6 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Water table: At the surface to 12 inches above the surface in spring and early in summer; at the surface to 6 inches below the surface during the rest of the year
Frequency of flooding: Rare

### Inclusions

Soils that are similar to Judkins soils but have an extremely stony surface layer, have less than 35 percent coarse fragments below a depth of 10 inches, and are poorly drained (10 percent)

### Use and Management

Major uses: Rangeland, homesites
Major management factors: Wetness, frost action, ponding, permeability, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Common camas, tufted hairgrass, Nebraska sedge, other sedges, rushes
General management considerations:

- A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- The seasonal ponding and wetness limit the period of grazing.
- Seeding of suitable species to improve the range is limited by the wetness and the difficulty of eliminating the existing less desirable vegetation.

**Building site development**

General management considerations.

- Septic tank absorption fields can be expected to function poorly because of the wetness and the slow permeability.
- Onsite sewage disposal systems may be unsuitable because of a risk of polluting the ground water.
- The quality of roadbeds and road surfaces can be adversely affected by ponding and frost action.

### Capability Classification

Vlw, nonirrigated

## 13-Cryoborolls-Haploxerolls-Rock outcrop association, very steep

### Composition

Cryoborolls and similar inclusions-35 percent
Haploxerolls and similar inclusions-35 percent
Rock outcrop-20 percent
Contrasting inclusions-10 percent

### Characteristics of the Cryoborolls

Position on landscape: North-facing canyonsides and ravines (fig. 4)
Elevation: About 5,500 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 17 inches
Slope: 35 to 65 percent
Shape of slopes: Concave to convex
Rock fragments on surface: 0 to 80 percent gravel, cobbles, stones, and boulders
Reference profile:
0 to 6 inches-variable
6 to 25 inches-grayish brown stony loam
25 inches-unweathered bedrock
Depth class: Very shallow to very deep
Drainage class: Well drained
Permeability: Slow to rapid
Available water capacity: Very low to very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Haploxerolls

Position on landscape: South-facing canyonsides and ravines
Elevation: About 5,500 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 17 inches
Slope: 35 to 65 percent
Shape of slopes: Concave to convex
Rock fragments on surface: 0 to 70 percent gravel, cobbles, stones, and boulders
Reference profile:
0 to 10 inches-variable
10 to 50 inches-pale brown very gravelly sandy loam
50 inches-unweathered bedrock

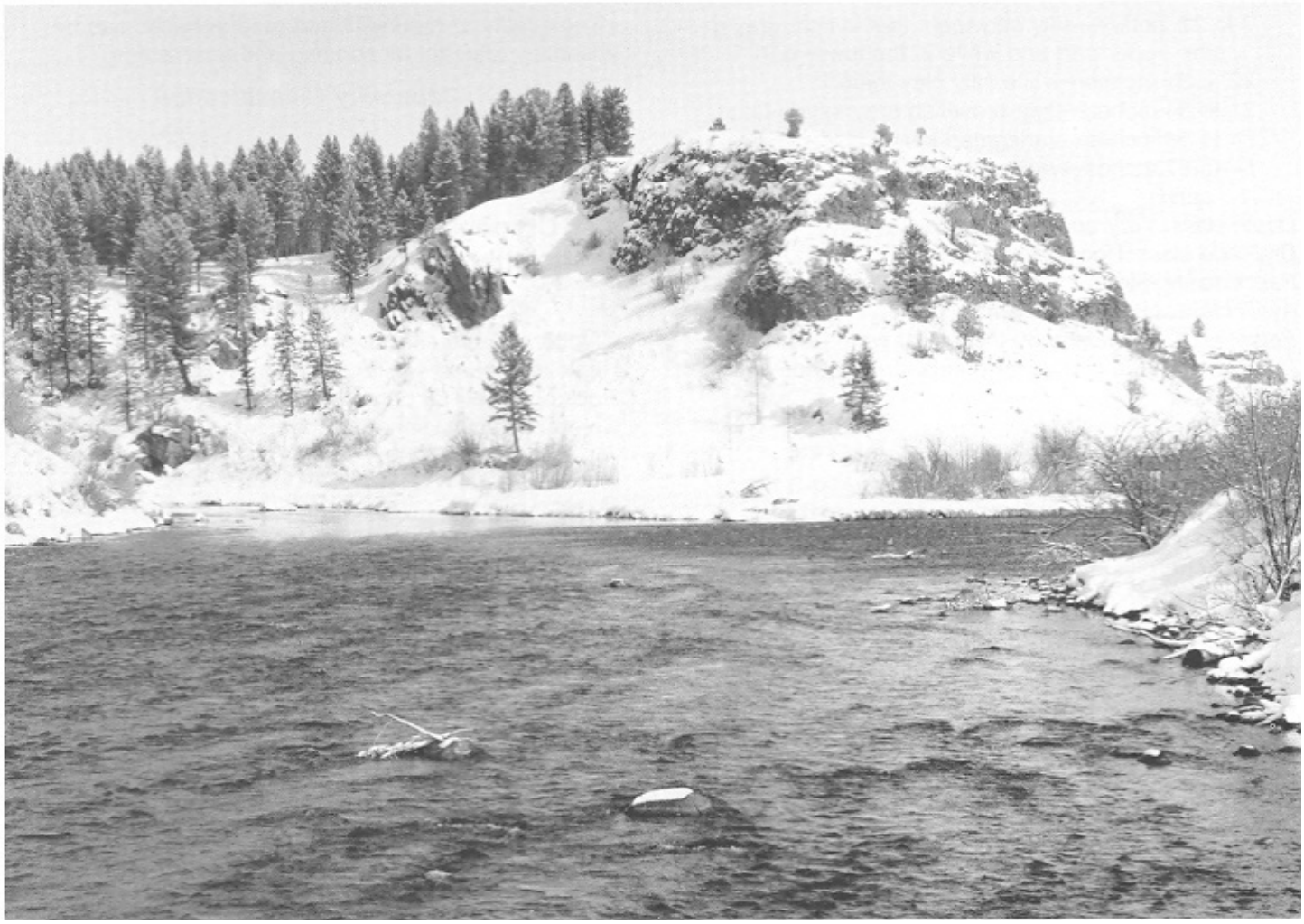

**Figure 4.-An area of Cryoborolls-Haploxerolls-Rock outcrop association, very steep. The confluence of the Henrys Fork of the Snake River and the Warm River is in the foreground.**

Depth class: Shallow to very deep
Drainage class: Well drained
Permeability: Moderately slow to moderately rapid
Available water capacity: Very low to very high
Runoff: Very rapid
Hazard of water erosion: Very severe

## Characteristics of the Rock Outcrop

Position on landscape: North- and south-facing canyonsides and rims Kind of material: Exposed basalt and rhyolite

## Inclusions

Rexburg, Ririe, and Tetonia silt loams (5 percent); Rin, Robana, and Greys silt loams (5 percent)

## Use and Management

Major uses: Rangeland, woodland
Major management factors: Stones, boulders, slope, Rock outcrop in some areas, a short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Douglas fir, aspen, snowberry, and pine reedgrass on north aspects; mountain big sagebrush, bluebunch wheatgrass, and juniper on south aspects
General management considerations:
•A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed

and the forage plants have achieved sufficient growth.

**Woodland (Cryoborolls)**

Common overstory plants: Douglas fir, aspen
Average canopy cover: 5 to 10 percent
Common understory plants: Bromegrass, bluegrass, sedge, snowberry, chokecherry, serviceberry, Woods rose

### Capability Classification

VIIe, nonirrigated

## 14-Crystalbutte-Vadnais-Katseanes complex, 1 to 30 percent slopes

### Composition

Crystalbutte loam and similar inclusions-45 percent
Vadnais silt loam and similar inclusions-20 percent
Katseanes silt loam and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Crystalbutte Soil

Position on landscape: Hillsides, swales on basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 23 inches-very dark grayish brown loam
23 to 40 inches-dark brown very cobbly clay loam
40 to 60 inches-dark brown very cobbly loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Medium or rapid
Hazard of water erosion: Moderate or severe

### Characteristics of the Vadnais Soil

Position on landscape: Hillsides, shoulder slopes on basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 14 inches-dark yellowish brown silt loam
14 to 28 inches-yellowish brown silt loam
28 to 36 inches-yellowish brown cobbly silty clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium or rapid
Hazard of water erosion: Moderate or severe

### Characteristics of the Katseanes Soil

Position on landscape: Basalt plains, hillsides, ridges, side slopes in dissected calderas
Elevation: About 6,600 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 13 inches-brown silt loam
13 to 17 inches-yellowish brown silt loam
17 inches-vesicular basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Medium or rapid
Hazard of water erosion: Moderate or severe

### Inclusions

Soils that are similar to the Vadnais and Katseanes soils but have more than 35 percent cobbles and stones throughout (5 percent); soils that are similar to the Crystalbutte soil but have less than 15 percent coarse fragments between depths of 10 and 40 inches and have bedrock at a depth of 40 to 60 inches (5 percent); Pinebutte silt loam and Rock outcrop (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Water erosion, depth to bedrock in some areas, cobbles and stones in some areas, a short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, bluebunch wheatgrass, Columbia needlegrass, mountain big sagebrush, antelope bitterbrush, arrowleaf balsamroot
General management considerations:

- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Seeding of suitable species to improve the range is limited by the slope and the depth to bedrock in some areas.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

### Capability Classification

IVe, nonirrigated

## 15-Diston loamy sand, 1 to 4 percent slopes

### Composition

Diston soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Diston Soil

Position on landscape: Basalt plains
Elevation: About 5,000 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 10 inches-brown loamy sand
10 to 32 inches-very pale brown loamy sand
32 to 34 inches-hardpan
34 to 60 inches-very pale brown sand
Depth class: Moderately deep to a hardpan
Drainage class: Somewhat excessively drained
Permeability: Rapid above the hardpan
Available water capacity: Very low
Potential rooting depth: 20 to 40 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Grassyridge sand (15 percent); soils that are similar to the Diston soil but have a hardpan at a depth of 10 to 20 inches and Modkin loamy sand (5 percent)

### Use and Management

Major uses: Irrigated cropland, windbreaks
Major management factors: Available water capacity, depth to the hardpan, wind erosion, permeability

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, pasture, potatoes
General management considerations.- The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface, using stubble mulch tillage, and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Golden willow, Russian olive, Rocky Mountain juniper
Shrubs suitable for planting: Siberian peashrub, lilac, Nanking cherry, Peking cotoneaster
General management considerations:
• Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.
• Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

IVe, irrigated; VIIe, nonirrigated

## 16-Diston-Grassyridge complex, 1 to 4 percent slopes

### Composition

Diston loamy sand and similar inclusions-45 percent
Grassyridge sand and similar inclusions-35 percent
Contrasting inclusions-20 percent

### Characteristics of the Diston Soil

Position on landscape: Basalt plains
Elevation: About 5,100 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 10 inches-brown loamy sand
10 to 32 inches-very pale brown loamy sand
32 to 34 inches-hardpan
34 to 60 inches-very pale brown sand
Depth class: Moderately deep to a hardpan
Drainage class: Somewhat excessively drained
Permeability: Rapid above the hardpan
Available water capacity: Very low
Potential rooting depth: 20 to 40 inches
Runoff: Very slow
Hazard of water erosion: Slight Hazard of wind erosion: Very severe

### Characteristics of the Grassyridge Soil

Position on landscape: Basalt plains
Elevation: About 5,100 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 8 inches-brown sand
8 to 28 inches-brown fine sand
28 to 49 inches-grayish brown fine sand
49 to 60 inches-gray fine sand
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Very slow

Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Rock outcrop (5 percent); Wolverine sand (5 percent); Nayrib very cobbly fine sandy loam (5 percent); Modkin fine sand (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland, windbreaks
Major management factors: Available water capacity in some areas, depth to the hardpan in some areas, wind erosion, permeability

**Rangeland**

Dominant vegetation in potential natural plant community: Basin big sagebrush, Indian ricegrass, need leandthread, bluebunch wheatgrass, antelope bitterbrush
General management considerations:

- Seeding of suitable species to improve the range is limited by the hazard of wind erosion and the low available water capacity.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:

- The best suited irrigation method is a sprinkler system.
- Maintaining crop residue on the surface, using stubble mulch tillage, and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Golden willow, Russian olive, Rocky Mountain juniper
Shrubs suitable for planting: Siberian peashrub, lilac, Nanking cherry, Peking cotoneaster
General management considerations:

- Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.
- Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

lVe, irrigated; VIIe, nonirrigated

## 17-Dune land

### Composition

Dune land-95 percent
Rock outcrop and shallow soils-5 percent

### Characteristics of the Dune Land

Position on landscape: Basalt plains
Slope: 2 to 40 percent
Kind of material: Active barchan sand
Vegetation: Little, if any

### Capability Classification

VIIIe, nonirrigated

## 18-Eginbench loamy fine sand, 0 to 2 percent slopes

### Composition

Eginbench soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Eginbench Soil

Position on landscape: River terraces
Elevation: About 4,900 feet
Average annual air temperature: About 43 degrees F
Frost-free period: About 100 days
Average annual precipitation: About 12 inches
Typical profile:
0 to 11 inches-dark grayish brown loamy fine sand
11 to 26 inches-brown loamy fine sand
26 to 37 inches-brown coarse sand
37 to 60 inches-gray coarse sand
Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe
Depth to the water table: 12 to 48 inches during the cropping season

### Inclusions

Soils that are similar to the Eginbench soil but are in depressions and are poorly drained (10 percent); St. Anthony gravelly sandy loam (5 percent); Wolverine fine sand (5 percent)

### Use and Management

Major uses: Irrigated cropland, windbreaks
Major management factors: Cobbles and stones in some areas, permeability

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, pasture, potatoes
General management considerations:

- This soil is easily eroded by the wind unless the surface is protected.
- Maintaining crop residue on the surface and seeding a

permanent cover of grasses and legumes reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Russian olive, golden willow, idahybrid poplar, Rocky Mountain juniper, Norway spruce
Shrubs suitable for planting: Lilac, Nanking cherry, Siberian peashrub
General management considerations:
• Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

IVe, irrigated

## 19-Engett, bedrock substratum-Engett-Blacksan complex, 1 to 6 percent slopes

### Composition

Engett fine sand, bedrock substratum, and similar inclusions-35 percent
Engett fine sand and similar inclusions-30 percent
Blacksan loamy fine sand and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Engett Soil, Bedrock Substratum

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 4 inches-very dark grayish brown fine sand
4 to 27 inches-dark brown fine sand
27 to 39 inches-yellowish brown fine sand
39 to 45 inches-yellowish brown loamy fine sand
45 inches-vesicular basalt
Depth class: Deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Low
Potential rooting depth: 40 to 60 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Engett Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 46 inches-brown fine sand
46 to 60 inches-yellowish brown loamy fine sand
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Blacksan Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 10 inches-dark grayish brown loamy fine sand
10 to 19 inches-dark grayish brown fine sand
19 to 32 inches-brown fine sand
32 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Excessively drained
Permeability: Rapid
Available water capacity: Very low
Potential rooting depth: 20 to 40 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Sandcreek sand and Rock outcrop (10 percent); soils that are similar to the Engett soil but are in depressions in the area of Mackert Pond and are somewhat poorly drained (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland
Major management factors: Wind erosion, depth to bedrock in some areas, available water capacity

**Rangeland**

Dominant vegetation in potential natural plant community: Need leandthread, antelope bitterbrush, thickspike wheatgrass, western wheatgrass, basin big sagebrush, arrowleaf balsamroot
General management considerations:
•Production is limited mainly by droughtiness.
• Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion and the restricted available water capacity.

• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of wind erosion.

**Irrigated cropland**

Commonly grown crops: Barley, potatoes
General management considerations:
• These soils are easily eroded by the wind unless the surface is protected.
• Drifting sand can damage or bury young crops, and wind erosion can expose the bedrock.
• The best suited irrigation method is a sprinkler system.
• Seeding a permanent cover of grasses and legumes, maintaining crop residue on the surface, and maintaining the plant cover reduce the risk of wind erosion.
• Irrigation water should be applied in amounts large enough to wet the root zone but small enough to prevent leaching of plant nutrients.

### Capability Classification

IVe, irrigated; VIIe, nonirrigated

## 20-Fluvaquents, 0 to 1 percent slopes

### Composition

Fluvaquents and similar inclusions-90 percent
Contrasting inclusions-10 percent

### Characteristics of the Fluvaquents

Position on landscape: Drainageways, flood plains
Elevation: About 5,000 feet
Average annual air temperature: About 43 degrees F
Frost-free period: About 92 days
Average annual precipitation: About 14 inches
Reference profile:
0 to 30 inches-grayish brown silt loam
30 to 60 inches-light gray very gravelly sandy loam
Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to rapid
Available water capacity: Moderate to very high
Runoff: Very slow
Hazard of water erosion: Slight
Water table: 12 inches above to 12 inches below the surface from May through October; more than 12 inches below during the rest of the year
Frequency of flooding: Frequent

### Inclusions

St. Anthony and Allwit gravelly sandy loams (10 percent)

#### Use and Management

Major use: Rangeland in the drier areas
Major management factors: Wetness, flooding, frost action
Dominant vegetation in potential natural plant community:
Western wheatgrass, Kentucky bluegrass, sedge, cinquefoil, yarrow, Woods rose, willow
General management considerations:
• The seasonal flooding and wetness limit the period of grazing.

### Capability Classification

VIIIw, nonirrigated

## 21-Fourme loam, 0 to 4 percent slopes

### Composition

Fourme soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Fourme Soil

Position on landscape: Fan terraces
Elevation: About 6,500 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation. About 24 inches
Typical profile:
0 to 5 inches-brown loam
5 to 15 inches-yellowish brown gravelly loam
15 to 23 inches-yellowish brown very gravelly sandy clay loam
23 to 32 inches-variegated (dominantly light yellowish brown) extremely gravelly sandy clay loam
32 to 60 inches-variegated extremely gravelly sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow in the upper 32 inches; very rapid below a depth of 32 inches
Available water capacity: Moderate
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Fourme soil but have less than 35 percent coarse fragments between depths

of 5 and 25 inches (10 percent); soils that are similar to the Fourme soil but are poorly drained (5 percent)

### Use and Management

Major uses: Rangeland, hayland, pasture, summer homesites
Major management factors: Permeability, risk of seepage, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Idaho fescue, mountain big sagebrush, bluebunch wheatgrass, Nevada bluegrass, arrowleaf balsam root
General management considerations:
•Few limitations affect range seeding.
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

**Hay and pasture**

Suitable crops: Irrigated and non irrigated hay and pasture plants
General management considerations:
• Forage production and the choice of plants for seeding are limited by the very short growing season.

**Building site development**

General management considerations:
• Because of the instability of the soil, cutbanks can cave in.
• Excavation for roads can expose material that is highly susceptible to wind erosion.

### Capability Classification

VIs, irrigated and nonirrigated

## 22-Grassyridge sand, 2 to 20 percent slopes

### Composition

Grassyridge soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Grassyridge Soil

Position on landscape: Basalt plains
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 8 inches-brown sand
8 to 28 inches-brown fine sand
28 to 49 inches-grayish brown fine sand
49 to 60 inches-gray fine sand
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Inclusions

Wolverine sand (10 percent); Malm sand (5 percent); soils that are similar to the Grassyridge soil but have hardpan fragments on the surface and soils that are shallow over bedrock (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland
Major management factors: Wind erosion, depth to bedrock in some areas, permeability

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Indian ricegrass, need leandthread, yellow wildrye, antelope bitterbrush, basin big sagebrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Seeding a permanent cover of grasses and legumes, maintaining crop residue on the surface, and keeping tillage to a minimum reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Golden willow, Russian olive, Rocky Mountain juniper
Shrubs suitable for planting: Siberian peashrub, lilac, Nanking cherry, Peking cotoneaster
General management considerations:
• Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.
• Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

IVe, irrigated; VIIe, nonirrigated

## 23-Grassyridge sand, bedrock substratum, 1 to 4 percent slopes

### Composition

Grassyridge soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Grassyridge Soil

Position on landscape: Basalt plains
Elevation: About 5,000 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 9 inches-brown sand
9 to 36 inches-pale brown loamy sand
36 to 50 inches-light gray fine sand
50 inches-basalt
Depth class: Deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Moderate
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Malm loamy sand (5 percent); Wolverine sand (5 percent); Diston loamy sand (5 percent); Modkin soils and Rock outcrop (5 percent)

### Use and Management

Major use: Irrigated cropland
Major management factors: Depth to bedrock, water erosion, permeability

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:

- The best suited irrigation method is a sprinkler system.
- Maintaining crop residue on the surface, keeping tillage to a minimum, keeping mulch on the surface, seeding a permanent cover of grasses and legumes, and maintaining the plant cover reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting. Golden willow, Russian olive, Rocky Mountain juniper
Shrubs suitable for planting: Siberian peashrub, lilac, Nanking cherry, Peking cotoneaster
General management considerations:

- Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.
- Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

IVe, irrigated; Vlle, nonirrigated

## 24-Greentimber-Marystown-Robinlee silt loams, 1 to 4 percent slopes

### Composition

Greentimber soil and similar inclusions-40 percent
Marystown soil and similar inclusions-25 percent
Robinlee soil and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Greentimber Soil

Position on landscape: Plains, loess-covered moraines
Elevation: About 5,400 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 20 inches-silt loam that is dark brown in the upper part and brown in the lower part
20 to 31 inches-yellowish brown silty clay loam
31 to 57 inches-brown clay loam
57 to 60 inches-yellowish brown gravelly clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Marystown Soil

Position on landscape: Plains, loess-covered moraines
Elevation: About 5,400 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Robinlee Soil

Position on landscape: Plains and loess-covered moraines, dominantly in the western part of the Greentimber area
Elevation: About 5,400 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 11 inches-dark brown silt loam
11 to 23 inches-dark yellowish brown silt loam
23 to 41 inches-yellowish brown silty clay loam
41 to 52 inches-light yellowish brown loam
52 to 63 inches-dark yellowish brown loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

#### Inclusions

Marotz silt loam (10 percent); soils that are similar to the Robinlee soil but have cobbles, stones, or boulders at a depth of 20 to 40 inches (5 percent)

#### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Boulders, gravel, cobbles, and stones in some areas, frost action, permeability

**Cropland**

Suitable crops: Irrigated potatoes, wheat, and barley; nonirrigated barley
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Properly regulating applications of irrigation water helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and subsoiling potato fields help to maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 25-Greys-Robana silt loams, 1 to 4 percent slopes

#### Composition

Greys soil and similar inclusions-45 percent
Robana soil and similar inclusions-45 percent
Contrasting inclusions-10 percent

### Characteristics of the Greys Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,900 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 5 inches-brown silt loam
5 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 95 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Robana Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,900 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-dark brown silt loam
12 to 19 inches-brown silt loam
19 to 34 inches-yellowish brown silt loam
34 to 54 inches-light yellowish brown silt loam
54 to 80 inches-yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

#### Inclusions

Rin silt loam in drainageways (5 percent); Marystown and Marotz silt loams in drainageways (5 percent)

#### Use and Management

Major use: Nonirrigated cropland
Major management factors: Frost action, permeability, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope help to maintain tilth and increase the rate of water intake.
• Production is limited mainly by the short growing season.

### Capability Classification

lVc, nonirrigated

## 26-Greys-Robana silt loams, 4 to 12 percent slopes

### Composition

Greys soil and similar inclusions-50 percent
Robana soil and similar inclusions-40 percent
Contrasting inclusions-10 percent

### Characteristics of the Greys Soil

Position on landscape: Loess-covered foothills
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 5 inches-brown silt loam
5 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 95 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Robana Soil

Position on landscape: Loess-covered foothills
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-dark brown silt loam
12 to 19 inches-brown silt loam
19 to 34 inches-yellowish brown silt loam
34 to 54 inches-light yellowish brown silt loam
54 to 80 inches-yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Rin silt loam in drainageways (5 percent); Marystown and Marotz silt loams in drainageways (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, frost action, permeability, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.
• Production is limited mainly by the short growing season.

### Capability Classification

lVe, nonirrigated

## 27-Greys-Robana silt loams, 12 to 20 percent slopes

### Composition

Greys soil and similar inclusions-45 percent
Robana soil and similar inclusions-35 percent
Contrasting inclusions-20 percent

### Characteristics of the Greys Soil

Position on landscape: Loess-covered foothills
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 5 inches-brown silt loam
5 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 95 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Robana Soil

Position on landscape: Loess-covered foothills
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches

Typical profile:
0 to 12 inches-dark brown silt loam
12 to 19 inches-brown silt loam
19 to 34 inches-yellowish brown silt loam
34 to 54 inches-light yellowish brown silt loam
54 to 80 inches-yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Rin silt loam in drainageways (10 percent); Tetonia and Lantonia silt loams on ridgetops and south-facing side slopes (5 percent); soils that are similar to the Robana soil but are in drainageways and have 5 to 25 percent gravel and cobbles throughout (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Seeding a permanent cover of grasses and legumes reduces the risk of erosion.
• Production is limited mainly by the short growing season.

#### Capability Classification

IVe, nonirrigated

## 28-Greys-Turnerville silt loams, 1 to 4 percent slopes

### Composition

Greys soil and similar inclusions-45 percent
Turnerville soil and similar inclusions-40 percent
Contrasting inclusions-15 percent

#### Characteristics of the Greys Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 5 inches-brown silt loam
5 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 95 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

#### Characteristics of the Turnerville Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 5 inches-pale brown silt loam
5 to 15 inches-light yellowish brown silt loam
15 to 22 inches-light gray and yellowish brown silt loam
22 to 33 inches-brown silt loam
33 to 63 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

#### Inclusions

Greys and Turnerville soils that have slopes of more than 4 percent (5 percent); soils that are similar to the Greys and Turnerville soils but are near canyon rims and have 5 to 25 percent gravel or cobbles throughout (5 percent); Robana silt loam (5 percent)

#### Use and Management

Major uses: Woodland, grazable woodland, nonirrigated cropland, homesites
Major management factors: Frost action, permeability, low strength, a short growing season

**Nonirrigated cropland**

Suitable crops: Barley, alfalfa hay
General management considerations:
• Maintaining crop residue on the surface, chiseling or

subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope maintain tilth and increase the rate of water intake.
• Production is limited mainly by the short growing season.

**Woodland**

Mean site index for quaking aspen: Greys soil-65
Estimated average annual production per acre of quaking aspen: About 36 cubic feet from a stand of trees 80 years old
Mean site index for lodgepole pine: Turnerville soil-79
Estimated average annual production per acre of lodgepole pine: About 68 cubic feet from a stand of trees 100 years old
General management considerations:
• Constructing water bars helps to protect roads and landings from erosion.

**Grazable understory**

Common forest understory plants: Greys soil-blue wildrye, mountain brome, slender wheatgrass, pine reedgrass, elk sedge, big bluegrass, edible valerian, aspen peavine, lupine, sticky geranium, quaking aspen, snowberry; Turnerville soil-pine reedgrass, blue wildrye, mountain brome, Kentucky bluegrass, lupine, sticky geranium, Fendler meadowrue, western yarrow, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: Greys soil-about 2,000 pounds per acre under an open canopy and 800 pounds per acre under a closed canopy; Turnerville soil-about 1,500 pounds per acre under an open canopy and 500 pounds per acre under a closed canopy
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Windfall is a hazard in some areas.

**Building site development**

General management considerations.
• The quality of roadbeds and road surfaces can be adversely affected by the low strength and frost action.
• Septic tank absorption fields can be expected to function poorly because of the limited permeability, which restricts the movement and filtration of the effluent.

### Capability Classification

IVc, nonirrigated

## 29-Greys-Turnerville silt loams, 4 to 12 percent slopes

### Composition

Greys soil and similar inclusions-45 percent
Turnerville soil and similar inclusions-40 percent
Contrasting inclusion-15 percent

### Characteristics of the Greys Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 5 inches-brown silt loam
5 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 95 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Turnerville Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 5 inches-pale brown silt loam
5 to 15 inches-light yellowish brown silt loam
15 to 22 inches-light gray and yellowish brown silt loam
22 to 33 inches-brown silt loam
33 to 63 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff. Rapid
Hazard of water erosion: Severe

### Inclusion

Marotz silt loam (15 percent)

### Use and Management

Major uses: Woodland, grazable woodland, homesites

Major management factors: Water erosion, frost action, permeability, slope, a short growing season

**Woodland**

Common forest overstory plants: Greys soil-quaking aspen; Turnerville soil-lodgepole pine
Mean site index for quaking aspen: Greys soil-65
Estimated average annual production per acre of quaking aspen (noncommercial): About 36 cubic feet from a stand of trees 80 years old
Mean site index for lodgepole pine: Turnerville soil-79
Estimated average annual production per acre of lodgepole pine (noncommercial): About 68 cubic feet from a stand of trees 100 years old
General management considerations:
• Constructing water bars helps to protect roads and landings from erosion.

**Grazable understory**

Common forest understory plants: Greys soil-blue wildrye, mountain brome, slender wheatgrass, pine reedgrass, elk sedge, big bluegrass, edible valerian, aspen peavine, lupine, sticky geranium, quaking aspen, snowberry; Turnerville soil-pine reedgrass, blue wildrye, mountain brome, Kentucky bluegrass, lupine, sticky geranium, Fendler meadowrue, western yarrow, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: Greys soil-about 2,000 pounds per acre under an open canopy and 800 pounds per acre under a closed canopy; Turnerville soil-about 1,500 pounds per acre under an open canopy and 500 pounds per acre under a closed canopy
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Windfall is a hazard in some areas.

**Building site development**

General management considerations:
• The quality of roadbeds and road surfaces can be adversely affected by frost action and low strength.
• Septic tank absorption fields can be expected to function poorly because of the limited permeability, which restricts the movement and filtration of the effluent.

## Capability Classification

lVe, nonirrigated

## 30-Greys-Turnerville silt loams, 12 to 20 percent slopes

### Composition

Greys soil and similar inclusions-45 percent
Turnerville soil and similar inclusions-40 percent
Contrasting inclusion-15 percent

### Characteristics of the Greys Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 5 inches-brown silt loam
5 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 95 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Turnerville Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 5 inches-pale brown silt loam
5 to 15 inches-light yellowish brown silt loam
15 to 22 inches-light gray and yellowish brown silt loam
22 to 33 inches-brown silt loam
33 to 63 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusion

Marotz silt loam (15 percent)

### Use and Management

Major uses: Woodland, grazable woodland

Major management factors: Water erosion, the shrink-swell potential in some areas, a short growing season

**Woodland**

Common forest overstory plants: Greys soil-quaking aspen; Turnerville soil-lodgepole pine
Mean site index for quaking aspen: Greys soil-65
Estimated average annual production per acre of quaking aspen: About 36 cubic feet from a stand of trees 80 years old
Mean site index for lodgepole pine: Turnerville soil-79
Estimated average annual production per acre of lodgepole pine: About 68 cubic feet from a stand of trees 100 years old
General management considerations:
• Seeding roads, cutbanks, and landings and constructing water bars to protect roads and landings reduce the risk of erosion.

**Grazable understory**

Common forest understory plants: Greys soil-blue wildrye, mountain brome, slender wheatgrass, pine reedgrass, elk sedge, big bluegrass, edible valerian, aspen peavine, lupine, sticky geranium, quaking aspen, snowberry; Turnerville soil-pine reedgrass, blue wildrye, mountain brome, Kentucky bluegrass, lupine, sticky geranium, Fendler meadowrue, western yarrow, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: Greys soil-about 2,000 pounds per acre under an open canopy and 800 pounds per acre under a closed canopy; Turnerville soil-about 1,500 pounds per acre under an open canopy and 500 pounds per acre under a closed canopy
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Windfall is a hazard in some areas.

### Capability Classification

IVe, nonirrigated

## 31-Hagenbarth-Pinebutte-Katseanes silt loams, 1 to 12 percent slopes

### Composition

Hagenbarth soil and similar inclusions-30 percent
Pinebutte soil and similar inclusions-30 percent
Katseanes soil and similar inclusions-20 percent
Contrasting inclusions-20 percent

### Characteristics of the Hagenbarth Soil

Position on landscape: Basalt plains
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 9 inches-brown silt loam
9 to 24 inches-brown and yellowish brown silt loam
24 to 38 inches-yellowish brown silty clay loam
38 to 54 inches-light yellowish brown and brown sandy clay loam
54 to 57 inches-brown loamy sand
57 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Pinebutte Soil

Position on landscape: Basalt plains
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 7 inches-dark brown silt loam
7 to 35 inches-yellowish brown silty clay loam
35 to 41 inches-pale brown silt loam
41 to 48 inches-white and light gray silt loam
48 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Very high
Restriction affecting the rooting depth: Bedrock at a depth of 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Katseanes Soil

Position on landscape: Drainageways, hillsides, ridges
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 17 inches-brown and yellowish brown silt loam

17 inches-vesicular basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Hagenbarth soil but have a layer of lime accumulation above the bedrock and soils that are similar to the Pinebutte soil but are cobbly in the lower part (10 percent); Nayrib and Vadnais soils (5 percent); Rock outcrop (5 percent)

#### Use and Management

Major use: Rangeland
Major management factors: Water erosion, depth to bedrock in some areas, a short growing season
Dominant vegetation in potential natural plant community: Hagenbarth and Pinebutte soils-mountain big sagebrush, Idaho fescue, Columbia needlegrass, Nevada bluegrass, bluebunch wheatgrass; Katseanes soil-mountain big sagebrush, antelope bitterbrush, bluebunch wheatgrass, Idaho fescue
General management considerations:

- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Seeding of suitable species to improve the range is limited by the depth to bedrock in some areas, the short growing season, and Rock outcrop in some areas.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

#### Capability Classification

IVe, nonirrigated

## 32-Hagenbarth-Vadnais silt loams, 1 to 12 percent slopes

### Composition

Hagenbarth soil and similar inclusions-55 percent
Vadnais soil and similar inclusions-25 percent
Contrasting inclusions-20 percent

### Characteristics of the Hagenbarth Soil

Position on landscape: Basalt plains
Elevation: About 5,700 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 24 inches-brown and yellowish brown silt loam
24 to 38 inches-yellowish brown silty clay loam
38 to 54 inches-light yellowish brown and brown sandy clay loam
54 to 57 inches-brown loamy sand
57 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Vadnais Soil

Position on landscape: Basalt plains
Elevation: About 5,700 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 14 inches-dark yellowish brown silt loam
14 to 28 inches-yellowish brown silt loam
28 to 36 inches-yellowish brown cobbly silty clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Katseanes silt loam and Nayrib very cobbly fine sandy loam (10 percent); Stipe fine sandy loam and Pinebutte silt loam (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock in some areas, water erosion, risk of seepage, a short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, Columbia needlegrass, Nevada bluegrass, slender wheatgrass, bluebunch wheatgrass, mountain big sagebrush, arrowleaf balsamroot

General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 33-Hagenbarth, loamy surface-Vadnais-Katseanes loams, 20 to 50 percent slopes

### Composition

Hagenbarth soil and similar inclusions-30 percent
Vadnais soil and similar inclusions-30 percent
Katseanes soil and similar inclusions-15 percent
Contrasting inclusions-25 percent

### Characteristics of the Hagenbarth Soil

Position on landscape: Canyons in dissected calderas
Elevation: About 5,650 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Organic mat on surface: 1.5 inches of decomposing leaves
Typical profile:
0 to 14 inches-very dark grayish brown and dark brown loam
14 to 35 inches-brown gravelly loam
35 to 60 inches-light reddish brown clay loam and clay
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Vadnais Soil

Position on landscape: Hillsides in dissected calderas
Elevation: About 5,650 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 24 inches-brown and yellowish brown loam and gravelly loam
24 to 34 inches-light reddish brown clay
34 inches-weathered rhyolite
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Katseanes Soil

Position on landscape: Hillsides in dissected calderas
Elevation: About 5,650 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 9 inches-dark grayish brown loam
9 to 18 inches-dark brown and brown silt loam
18 inches-hard rhyolite
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Rock outcrop on ridges (10 percent); Sadorus loam on ridges (5 percent); soils that are similar to the Katseanes soil but are on ridges and have bedrock within a depth of 10 inches (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Water erosion, depth to bedrock, plant competition in some areas, slope, a short growing season
Dominant vegetation in potential natural plant community: Mountain big sagebrush, bluebunch wheatgrass, Idaho fescue, antelope bitterbrush; aspen groves on some of the north- and east-facing slopes; seral ceanothus thickets covering most of the ridges
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

### Capability Classification

Vle, nonirrigated

## 34-Hagenbarth, moist-Vadnais-Katseanes loams, 2 to 20 percent slopes

### Composition

Hagenbarth soil and similar inclusions-30 percent
Vadnais soil and similar inclusions-30 percent
Katseanes soil and similar inclusions-15 percent
Contrasting inclusions-25 percent

### Characteristics of the Hagenbarth Soil

Position on landscape: Canyons in dissected calderas
Elevation: About 6,280 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 50 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 14 inches-dark brown loam
14 to 35 inches-brown and dark brown loam
35 to 60 inches-light reddish brown clay loam and clay
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Vadnais Soil

Position on landscape: Side slopes and hillsides in dissected calderas
Elevation: About 6,280 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 50 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 24 inches-brown and yellowish brown loam and gravelly loam
24 to 34 inches-light reddish brown clay
34 inches-weathered rhyolitic bedrock
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Katseanes Soil

Position on landscape: Side slopes and hillsides in dissected calderas
Elevation: About 6,280 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 50 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark grayish brown loam
9 to 18 inches-dark brown and brown silt loam
18 inches-hard rhyolite
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Rock outcrop on ridgetops (5 percent); Rin soils in deep, broad swales (5 percent); Sadorus soils on ridges (10 percent); soils that are similar to the major soils in the unit but have 15 to 80 percent rock fragments throughout (5 percent)

### Use and Management

Major uses: Rangeland, woodland, grazable woodland
Major management factors: Slope, depth to bedrock in some areas, water erosion, rooting depth in some areas, plant competition in some areas, a short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Hagenbarth soil-quaking aspen, slender wheatgrass, pine reedgrass, mountain brome; Vadnais and Katseanes soils-Idaho fescue, bluebunch wheatgrass, mountain big sagebrush, antelope bitterbrush; seral ceanothus thickets covering most areas
General management considerations:

- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Grazing should be deferred until about mid-June.

**Woodland (Hagenbarth soil)**

Common forest overstory plants: Quaking aspen
Mean site index for quaking aspen: 69
Estimated average annual production per acre of quaking aspen: About 38 cubic feet from a stand of trees 100 years old
General management considerations:

- Adequately designed road drainage systems reduce the risk of erosion.

**Grazable understory (Hagenbarth soil)**

Common forest understory plants: Pine reedgrass, slender wheatgrass, mountain brome, sticky geranium, groundsel, quaking aspen, Woods rose

Potential annual production of air-dry vegetation: About 2,500 pounds per acre under an open canopy; about 900 pounds per acre under a closed canopy
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

### Capability Classification

Vle, nonirrigated

## 35-Haploxerolls-Rock outcrop complex, very steep

### Composition

Haploxerolls and similar inclusions-about 50 percent
Rock outcrop-about 30 percent
Contrasting inclusions-about 20 percent

### Characteristics of the Haploxerolls

Position on landscape: Canyonsides, ravines, shoulder slopes
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 16 inches
Slope: 35 to 60 percent
Rock fragments on surface: 5 to 85 percent gravel, stones, cobbles, and boulders
Reference profile:
0 to 10 inches-variable
10 to 28 inches-light yellowish brown very cobbly sandy loam
28 inches-rhyolite
Depth class: Shallow to very deep
Drainage class: Well drained
Permeability: Moderately slow to moderately rapid
Available water capacity: Moderate to very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Rock Outcrop

Position on landscape: South- and west-facing shoulder slopes and side slopes of canyons and ravines Kind of material: Exposed rhyolite

### Inclusions

Soils that have slopes of less than 35 percent and are on shoulder slopes and Rexburg, Ririe, Kucera, and Lostine silt loams and very fine sandy loams on canyonsides (about 20 percent)

### Capability Classification

Vlle, nonirrigated

## 36-Henryslake gravelly loam, 0 to 4 percent slopes

### Composition

Henryslake soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

#### Characteristics of the Henryslake Soil

Position on landscape: Outwash plains
Elevation: About 6,400 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 28 inches
Typical profile:
0 to 3 inches-grayish brown gravelly loam
3 to 10 inches-grayish brown gravelly clay loam
10 to 23 inches-grayish brown very gravelly clay loam
23 to 60 inches-light yellowish brown extremely gravelly loam
Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Available water capacity: High
Potential rooting depth: 60 inches for water-tolerant plants; 0 to 24 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Seasonal high water table: 12 inches above to 24 inches below the surface; generally perched on the surface late in spring and early in summer

### Inclusions

Soils that are similar to the Henryslake soil but are better drained (10 percent); soils that are similar to the Henryslake soil but have bedrock within a depth of 60 inches (5 percent); soils that are similar to. the Henryslake soil but have less clay and gravel throughout (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wetness, a very short growing season
Dominant vegetation in potential natural plant community: Sedge, wheatgrass, mountain brome, tufted hairgrass
General management considerations:
• Seeding of suitable species to improve the range is limited by the wetness, the difficulty of preparing an adequate seedbed, and the difficulty of eliminating the existing less desirable vegetation.
•A very cold soil temperature limits plant growth;

therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• The seasonal ponding and wetness limit the period of grazing.

### Capability Classification

Vw, nonirrigated

## 37-Jipper fine sandy loam, 1 to 6 percent slopes

### Composition

Jipper soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Jipper Soil

Position on landscape: Basalt plains
Elevation: About 5,400 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-grayish brown fine sandy loam
8 to 21 inches-brown very fine sandy loam
21 to 45 inches-light gray very fine sandy loam
45 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Jipper soil but have bedrock at a depth of 20 to 40 inches and Jipper soils that have bedrock at a depth of more than 60 inches (10 percent); soils that are similar to the Jipper soil but do not have a layer of lime accumulation above the bedrock (5 percent); Rock outcrop and Nayrib very cobbly fine sandy loam on ridges (5 percent)

### Use and Management

Major uses: Irrigated and nonirrigated cropland, rangeland
Major management factor: Wind erosion

**Cropland**

Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated wheat, barley, and alfalfa

General management considerations:
• Irrigated crops can be grown if an adequate supply of water is available.
• The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Rangeland**

Dominant vegetation in potential natural plant community:
Bluebunch wheatgrass, Letterman needlegrass, mountain big sagebrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Seepage limits the construction of livestock watering ponds and other water impoundments.

### Capability Classification

IIIe, irrigated; IVe, nonirrigated

## 38-Jipper-Nayrib-Stipe complex, 1 to 8 percent slopes

### Composition

Jipper fine sandy loam and similar inclusions-50 percent
Nayrib very cobbly fine sandy loam and similar inclusions-20 percent
Stipe fine sandy loam and similar inclusions-20 percent
Contrasting inclusions-10 percent

### Characteristics of the Jipper Soil

Position on landscape: Swales on basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Slope: 1 to 6 percent
Typical profile:
0 to 8 inches-grayish brown fine sandy loam
8 to 21 inches-brown very fine sandy loam
21 to 45 inches-light gray very fine sandy loam
45 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High

Potential rooting depth: 40 to 60 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Nayrib Soil

Position on landscape: Ridges and blowouts on basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-brown very cobbly fine sandy loam
8 inches-unweathered basalt
Depth class: Very shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 6 to 10 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Slight

### Characteristics of the Stipe Soil

Position on landscape: Swales and hillsides on basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 12 inches-brown fine sandy loam
12 to 34 inches-brown very fine sandy loam
34 to 36 inches-light gray very fine sandy loam
36 inches-unweathered basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Inclusions

Rock outcrop (5 percent); Jipper soils that have bedrock at a depth of more than 60 inches (5 percent)

### Use and Management

Major uses: Irrigated and nonirrigated cropland, rangeland
Major management factors: Wind erosion, depth to bedrock in some areas, cobbles and stones in some areas

**Cropland**

Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa
General management considerations:
• Irrigated crops can be grown if an adequate supply of water is available.
• The best suited irrigation method is a sprinkler system.
• Water should be applied in amounts large enough to wet the root zone but small enough to prevent leaching of plant nutrients.
• Maintaining crop residue on the surface and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, Letterman needlegrass, mountain big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion and the depth to bedrock in some areas.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

IVe, irrigated and nonirrigated

## 39-Jipper-Ririe complex, 1 to 6 percent slopes

### Composition

Jipper fine sandy loam and similar inclusions-55 percent
Ririe silt loam and similar inclusions-25 percent
Contrasting inclusions-20 percent

### Characteristics of the Jipper Soil

Position on landscape: Loess-covered foothills on plains
Elevation: About 5,200 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 25 inches-brown and dark yellowish brown fine sandy loam
25 to 43 inches-light yellowish brown fine sandy loam

43 to 52 inches-very pale brown fine sandy loam
52 inches-rhyolite
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Potential rooting depth. 40 to 60 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Ririe Soil

Position on landscape: Loess-covered foothills on plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-brown silt loam
8 to 19 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
19 to 65 inches-very pale brown silt loam
Depth to an accumulation of lime: 7 to 16 inches
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 60 inches or more
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Moderate (high wind velocity)

### Inclusions

Soils that are similar to the Jipper soil but have an accumulation of lime within a depth of 20 inches (5 percent); soils that are similar to the Jipper soil but have at least 20 percent more clay between depths of 20 and 40 inches than in the upper 20 inches (5 percent); soils that are similar to Robinlee soils but are calcareous fine sandy loam in the upper 20 inches (5 percent); Jipper soils that have bedrock at a depth of more than 60 inches (5 percent)

### Use and Management

Major use: Irrigated cropland
Major management factor: Wind erosion
Suitable crops: Wheat, barley, potatoes, alfalfa
General management considerations:
• Because the subsoil is low in fertility, yields are reduced drastically when the surface layer is eroded.
• The best suited irrigation method is a sprinkler system.
• A tillage pan forms easily if this unit is tilled when wet.
• Chiseling or subsoiling stubble fields on the contour or across the slope in the fall, keeping tillage to a minimum, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IVe, nonirrigated

## 40-Jipper-Ririe-Kucera complex, 1 to 8 percent slopes

### Composition

Jipper fine sandy loam and similar inclusions-30 percent
Ririe silt loam and similar inclusions-25 percent
Kucera silt loam and similar inclusions-20 percent
Contrasting inclusions-25 percent

### Characteristics of the Jipper Soil

Position on landscape: Loess-covered hills on plains
Elevation: About 5,200 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 16 inches-brown fine sandy loam
16 to 44 inches-dark yellowish brown fine sandy loam
44 to 55 inches-very pale brown fine sandy loam
55 inches-rhyolite
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Characteristics of the Ririe Soil

Position on landscape: Loess-covered hills on plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F Frost-free period: About 90 days Average annual precipitation: About 16 inches Typical profile:
0 to 8 inches-brown silt loam
8 to 11 inches-yellowish brown silt loam
11 to 60 inches-silt loam that is very pale brown in the upper part and light yellowish brown in the lower part
Depth class: Very deep
Drainage class: Well drained

Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate
Hazard of wind erosion: Moderate (high wind velocity)

### Characteristics of the Kucera Soil

Position on landscape: Loess-covered hills on plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile.
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate
Hazard of wind erosion: Moderate (high wind velocity)

### Inclusions

Soils that are similar to the Jipper soil but have 18 to 40 percent clay at a depth of 20 to 60 inches (10 percent); soils that are similar to Nayrib very cobbly fine sandy loam but have a hardpan at a depth of 5 to 10 inches (5 percent); soils that are similar to Marystown and Robinlee soils but have a surface layer of fine sandy loam and a subsurface layer of sandy clay loam (5 percent); soils that are similar to the Jipper soil but have an accumulation of lime at a depth of 5 to 20 inches (5 percent)

### Use and Management

Major use: Irrigated cropland
Major management factor: Wind erosion
Suitable crops: Wheat, barley, potatoes, alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• The soils are strongly alkaline and low in fertility below a depth of 5 to 40 inches.
• Adjusting the rate at which irrigation water is applied to the available water capacity, the rate of water intake, and the needs of the crop helps to prevent overirrigation and the leaching of plant nutrients.
• Chiseling or subsoiling stubble fields on the contour or across the slope in the fall reduces the risk of erosion.

### Capability Classification

Ille, irrigated and nonirrigated

## 41-Judkins gravelly loam, 1 to 15 percent slopes

### Composition

Judkins soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Judkins Soil

Position on landscape: Mountainsides, terraces
Elevation: About 6,600 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 27 inches
Organic mat on surface: 6 inches thick
Typical profile:
0 to 1 inch-grayish brown loam
1 to 5 inches-light gray gravelly loam
5 to 8 inches-pale brown very gravelly loam
8 to 36 inches-light brownish gray extremely stony clay loam
36 inches-fractured rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Judkins soil but have bedrock at a depth of more than 40 inches (10 percent); soils that are similar to the Judkins soil but have more than 35 percent clay between a depth of 15 inches and the underlying bedrock (5 percent); soils that are similar to Booneville soils but have bedrock at a depth of 20 to 40 inches (5 percent)

### Use and Management

Major uses: Summer homesites, woodland, grazable woodland
Major management factors: Depth to bedrock; gravel, cobbles, and stones; water erosion; a very short growing season

**Woodland**

Common forest overstory plants: Douglas fir, lodgepole pine
Mean site index for Douglas fir: 60
Estimated average annual production per acre of Douglas fir: About 50 cubic feet from a stand of trees 100 years old
General management considerations:
• Droughtiness caused by the coarse fragments in the

soil increases the seedling mortality rate.

**Grazable understory**

Common forest understory plants: Pine reedgrass, bluegrass, western snowberry, lupine, heartleaf arnica, slender meadowrue

Potential annual production of air-dry vegetation: About 1,800 pounds per acre under an open canopy; about 800 pounds per acre under a closed canopy

General management considerations:

• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

• Adequately designed road drainage systems reduce the risk of erosion.

**Building site development**

General management considerations:

• Excavation is hampered by the limited depth to bedrock and the stones and cobbles in the soil.

• Septic tank absorption fields can be expected to function poorly because of the limited depth to bedrock and the large stones.

### Capability Classification

Vle, nonirrigated

## 42-Judkins stony silt loam, 1 to 4 percent slopes

### Composition

Judkins soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Judkins Soil

Position on landscape: Foot slopes
Elevation: About 6,600 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 27 inches
Rock fragments on surface: Stones, gravel
Organic mat on surface: About 2 inches thick
Typical profile:

0 to 4 inches-grayish brown stony silt loam
4 to 12 inches-pale brown very stony loam
12 to 28 inches-light yellowish brown very stony loam
28 to 37 inches-light yellowish brown extremely stony clay loam
37 inches-basalt

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Judkins soil but have less than 35 percent rock fragments throughout (10 percent); soils that are similar to the Judkins soil but have bedrock within a depth of 20 inches (5 percent)

### Use and Management

Major uses: Woodland, grazable woodland
Major management factors: Depth to bedrock, stones, a very short growing season

**Woodland**

Common forest overstory plants: Lodgepole pine, Douglas fir
Mean site index for Douglas fir. ¯60
Estimated average annual production per acre of Douglas fir: About 46 cubic feet from a stand of trees 100 years old
General management considerations:

• Stones on the surface cause breakage of falling timber and hinder yarding.

• Windthrow is a hazard when the soil is saturated and winds are strong.

**Grazable understory**

Common forest understory plants: Pine reedgrass, bluegrass, mountain brome, heartleaf arnica, slender meadowrue
Potential annual production of air-dry vegetation: About 1,800 pounds per acre under an open canopy; about 800 pounds per acre under a closed canopy
General management considerations.- A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

• Windfall is a hazard in some areas.

**Capability Classification**

Vle, nonirrigated

## 43-Juniperbute fine sand, 2 to 30 percent slopes

### Composition

Juniperbute soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Juniperbute Soil

Position on landscape: Stabilized dunes, basalt plains
Elevation: About 5,500 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Inclusions

Soils that are similar to the Juniperbute soil but have bedrock within a depth of 60 inches (10 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, available water capacity
Dominant vegetation in potential natural plant community: Needleandthread, thickspike wheatgrass, arrowleaf balsamroot, basin big sagebrush, antelope bitterbrush
General management considerations.
• Production is limited mainly by the low available water capacity.
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

Vlle, nonirrigated

## 44-Juniperbute-Rock outcrop complex, 1 to 30 percent slopes

### Composition

Juniperbute fine sand and similar inclusions-60 percent
Rock outcrop-20 percent
Contrasting inclusions-20 percent

### Characteristics of the Juniperbute Soil

Position on landscape: Stabilized dunes, basalt plains
Elevation: About 5,650 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Characteristics of the Rock Outcrop

Position on landscape: Shoulder slopes, escarpments, hillsides, and blowouts on basalt plains Kind of material: Exposed vesicular basalt

### Inclusions

Sandcreek sand (10 percent); soils that are similar to Sandcreek sand but have gravelly fine sand at a depth of 20 to 40 inches (10 percent)

#### Use and Management

Major use: Rangeland
Major management factors: Slope, wind erosion, available water capacity
Dominant vegetation in potential natural plant community: Needleandthread, thickspike wheatgrass, western wheatgrass, arrowleaf balsamroot, basin big sagebrush, antelope bitterbrush
General management considerations:
• Production is limited mainly by the low available water capacity.
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

Vlle, nonirrigated

## 45-Juniperbute-Wolverine, bedrock substratum fine sands, 1 to 30 percent slopes

### Composition

Juniperbute soil and similar inclusions-60 percent
Wolverine soil and similar inclusions-20 percent
Contrasting inclusions-20 percent

### Characteristics of the Juniperbute Soil

Position on landscape: Linear interridge areas on basalt plains
Elevation: About 5,450 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 12 inches
Typical profile:
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Characteristics of the Wolverine Soil

Position on landscape: Long, linear, stabilized dunes on basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 11 inches
Typical profile:
0 to 48 inches-fine sand that is brown in the upper part and pale brown in the lower part 48 inches-basalt
Depth class: Deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Potential rooting depth: 40 to 60 inches
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Inclusions

Rock outcrop on ridgetops and steep side slopes (5 percent); soils that are similar to Sandcreek sand but have 10 to 50 percent cobbles and stones throughout (15 percent)

### Use and Management

Major use: Rangeland
Major management factors: Slope, wind erosion, available water capacity, risk of seepage
Dominant vegetation in potential natural plant community: Needleandthread, thickspike wheatgrass, Indian ricegrass, arrowleaf balsamroot, basin big sagebrush, antelope bitterbrush
General management considerations:
• Production is limited mainly by the low available water capacity.
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIIe, nonirrigated

## 46-Katseanes-Rock outcrop-Vadnais complex, 1 to 12 percent slopes

### Composition

Katseanes silt loam and similar inclusions-30 percent
Rock outcrop-30 percent
Vadnais silt loam and similar inclusions-25 percent
Contrasting inclusions-15 percent

### Characteristics of the Katseanes Soil

Position on landscape: Basalt plains
Elevation: About 6,000 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 7 inches-brown silt loam
7 to 17 inches-brown and yellowish brown silt loam
17 inches-vesicular basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rock Outcrop

Position on landscape: Basalt plains
Kind of material: Exposed vesicular basalt occurring as pressure ridges and nearly level flows

### Characteristics of the Vadnais Soil

Position on landscape: Basalt plains
Elevation: About 6,000 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 14 inches-dark yellowish brown silt loam
14 to 28 inches-yellowish brown silt loam

28 to 36 inches-yellowish brown cobbly silty clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Vadnais soil but have more than 35 percent coarse fragments throughout (5 percent); soils that are similar to the Katseanes soil but have less than 19 percent clay throughout (5 percent); Nayrib very cobbly fine sandy loam and Stipe fine sandy loam (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Water erosion, depth to bedrock, a short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, bluebunch wheatgrass, mountain big sagebrush
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the depth to bedrock and the areas of Rock outcrop.
• The suitability of this unit for range seeding is poor. Seeding the better suited areas is difficult because of the pattern in which they occur with the areas of Rock outcrop and shallow soils.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

### Capability Classification

VIs, nonirrigated

## 47-Kitchell gravelly loam, 15 to 55 percent slopes

### Composition

Kitchell soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Kitchell Soil

Position on landscape: Mountainsides
Elevation: About 6,900 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 22 inches
Organic mat on surface: 2 inches thick Typical profile:
0 to 7 inches-dark brown gravelly loam
7 to 12 inches-dark brown cobbly loam
12 to 26 inches-dark brown and brown very cobbly loam
26 to 60 inches-very pale brown and yellow extremely cobbly loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Raynoldson gravelly loam (10 percent); soils that are similar to the Raynoldson soil but have more than 28 percent clay between depths of 10 and 40 inches (5 percent)

### Use and Management

Major uses: Woodland, grazable woodland, homesites Major management factors: Slope, water erosion, risk of seepage, cobbles and stones, a very short growing season

**Woodland**

Common forest overstory plants: Douglas fir
Mean site index for Douglas fir: 85
Estimated average annual production per acre of Douglas fir: About 77 cubic feet from a stand of trees 40 years old
General management considerations:
• The slope limits the kinds of equipment that can be used in forest management.
• Adequately designed road drainage systems reduce the risk of erosion.

**Grazable understory**

Common forest understory plants: Pine reedgrass, blue wildrye, mountain brome, Columbia needlegrass, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: About 500 pounds per acre under an open canopy; about 200 pounds per acre under a closed canopy
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

• Grazing of the forage by livestock is limited by the slope.

**Building site development**

General management considerations:
• Excavation is hampered by the stones and cobbles and the slope.
• The risk of seepage and the hazard of water pollution limit the use of this unit as a site for septic tank absorption fields.
• Special design and construction methods for buildings and access roads help to compensate for the slope.
• Culverts can be installed to carry seasonal runoff in areas where roads cross natural drainageways.
• Roads should be designed with an adequate cut-slope grade.

### Capability Classification

Vile, nonirrigated

## 48-Kucera-Lostine very fine sandy loams, 1 to 4 percent slopes

### Composition

Kucera soil and similar inclusions-45 percent
Lostine soil and similar inclusions-40 percent
Contrasting inclusions-15 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Slope: Nearly level to undulating
Typical profile:
0 to 11 inches-dark grayish brown very fine sandy loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Lostine Soil

Position on landscape. Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 20 inches-dark grayish brown very fine sandy loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to Rexburg soils but are very fine sandy loam throughout (10 percent); soils that are similar to Ririe soils but are very fine sandy loam throughout (5 percent)

### Use and Management

Major use: Irrigated cropland
Major management factor: Wind erosion
Suitable crops: Wheat, barley, potatoes
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the application of irrigation water helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of wind erosion.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 49-Kucera-Lostine silt loams, 0 to 2 percent slopes

### Composition

Kucera soil and similar inclusions-45 percent
Lostine soil and similar inclusions-45 percent
Contrasting inclusions-10 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam

41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Kucera silt loam, bedrock substratum, and Sarilda silt loam (5 percent); Marystown silt loam (5 percent)

### Use and Management

Major use: Irrigated cropland
Major management factor: Permeability
Suitable crops: Potatoes, wheat, barley, alfalfa, peas
General management considerations:
• The best suited irrigation method is a sprinkler system, but surface systems also are well suited.
• Regulating the application of irrigation water helps to control runoff and erosion.
• Maintaining crop residue on the surface reduces the risk of erosion, maintains tilth, and increases the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 50-Kucera-Lostine silt loams, 2 to 4 percent slopes

### Composition

Kucera soil and similar inclusions-55 percent
Lostine soil and similar inclusions-25 percent
Contrasting inclusions-20 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to Kucera silt loam, bedrock substratum, and Sarilda silt loam but have bedrock or cobbles and boulders at a depth of 10 to 40 inches (15 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Depth to bedrock in some areas, cobbles in some areas, boulders in some areas, Rock outcrop in some areas
Suitable crops: Irrigated potatoes, wheat, barley, alfalfa, and peas; nonirrigated barley, wheat, and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 51-Kucera-Lostine silt loams, 4 to 8 percent slopes

### Composition

Kucera soil and similar inclusions-55 percent
Lostine soil and similar inclusions-25 percent
Contrasting inclusions-20 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,300 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Soils that are similar to Kucera silt loam, bedrock substratum, and Sarilda silt loam but have bedrock or cobbles and boulders at a depth of 10 to 40 inches (10 percent); Marystown silt loam (5 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, cobbles in some areas, boulders in some areas
Suitable crops: Irrigated potatoes, wheat, barley, alfalfa, and peas; nonirrigated barley, wheat, and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, irrigated and nonirrigated

## 52-Kucera-Lostine silt loams, 8 to 12 percent slopes

### Composition

Kucera soil and similar inclusions-55 percent
Lostine soil and similar inclusions-40 percent
Contrasting inclusion-5 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,500 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,500 feet
Average annual air temperature: About 42 degrees F

Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile.
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusion

Marystown silt loam (5 percent)

#### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, slope
Suitable crops: Irrigated and nonirrigated wheat, barley, and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways and a permanent cover of grasses and legumes reduce the risk of erosion.

#### Capability Classification

IVe, irrigated and nonirrigated

## 53-Kucera-Sarilda very fine sandy loams, 1 to 4 percent slopes

#### Composition

Kucera soil and similar inclusions-40 percent
Sarilda soil and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Kucera Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 5 inches-brown very fine sandy loam
5 to 20 inches-dark brown very fine sandy loam
20 to 48 inches-brown silt loam
48 to 57 inches-pale brown silt loam
57 to 63 inches-very pale brown silt loam
Depth to an accumulation of lime: 30 to 43 inches
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 60 inches or more
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Sarilda Soil

Position on landscape: Loess-covered basalt plains and foothills
Elevation: About 5,300 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 24 inches-brown very fine sandy loam
24 to 38 inches-pale brown very fine sandy loam
38 inches-unweathered basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Sarilda soil but have bedrock at a depth of 10 to 20 inches and support mountain big sagebrush, chokecherry, antelope bitterbrush, and bluebunch wheatgrass (10 percent); soils that are similar to the Kucera soil but are gravelly sandy clay loam at a depth of 20 to 40 inches (10 percent)

#### Use and Management

Major uses: Irrigated and non irrigated cropland, rangeland
Major management factors: Wind erosion, permeability

**Cropland**

Suitable crops: Irrigated wheat, barley, and potatoes; nonirrigated wheat and barley
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Adjusting the rate at which irrigation water is applied

to the available water capacity and the rate of water intake helps to prevent overirrigation and the leaching of plant nutrients.
• Maintaining crop residue on the surface and keeping the soil rough and cloddy reduce the risk of wind erosion.

**Rangeland**

Dominant vegetation in potential natural plant community:
Bluebunch wheatgrass, Idaho fescue, mountain big sagebrush, needlegrass
General management considerations.
• Less than 15 percent of this unit supports native vegetation. The vegetation commonly is in small areas that are difficult to manage as rangeland, but it is grazed by some livestock during the dormant season.

### Capability Classification

IIIe, irrigated and nonirrigated

## 54-Kucera-Sarilda silt loams, 2 to 6 percent slopes

### Composition

Kucera soil and similar inclusions-40 percent
Sarilda soil and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,300 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 95 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Sarilda Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 95 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 8 inches-dark grayish brown silt loam
8 to 33 inches-brown silt loam
33 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Lostine silt loam (10 percent); Marystown silt loam (5 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Irrigated cropland
Major management factors: Gully erosion, depth to bedrock in some areas
Suitable crops: Wheat, barley, potatoes, alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 55-Kucera, bedrock substratum-Lostine silt loams, 1 to 6 percent slopes

### Composition

Kucera soil and similar inclusions-50 percent
Lostine soil and similar inclusions-30 percent
Contrasting inclusions-20 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,250 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 7 inches-dark brown silt loam
7 to 34 inches-brown and dark brown silt loam
34 to 41 inches-very pale brown silt loam
41 to 46 inches-light gray loam
46 inches-basalt

Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Lostine Soil

Position on landscape: Plains
Elevation: About 5,250 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Soils that are very shallow stony silt loam over bedrock (10 percent); soils that are similar to Ririe silt loam, bedrock substratum, but have 15 to 35 percent gravel throughout (5 percent); soils that are similar to the Kucera soil but have a hardpan at a depth of 40 to 60 inches (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, permeability
Suitable crops: Irrigated potatoes, barley, wheat, and alfalfa; nonirrigated barley, wheat, and alfalfa
General management considerations:

- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IIIe, irrigated and nonirrigated

## 56-Kucera, bedrock substratum-Sarilda silt loams, 1 to 4 percent slopes

### Composition

Kucera soil and similar inclusions-50 percent
Sarilda soil and similar inclusions-30 percent
Contrasting inclusions-20 percent

### Characteristics of the Kucera Soil

Position on landscape: Loessal plains
Elevation: About 5,150 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 95 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 7 inches-dark brown silt loam
7 to 34 inches-brown and dark brown silt loam
34 to 41 inches-very pale brown silt loam
41 to 46 inches-light gray loam
46 inches-basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Sarilda Soil

Position on landscape: Basalt plains
Elevation: About 5,150 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 95 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 30 inches-brown silt loam
30 inches-basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Kucera silt loam (10 percent); soils that are similar to Nayrib soils but are gravelly or very gravelly silt loam throughout (5 percent); soils that are similar to the Kucera soil but are gravelly or very gravelly silt loam throughout (5 percent)

### Use and Management

Major use. Irrigated cropland

Major management factors: Depth to bedrock in some areas, gravel in some areas, rooting depth in some areas
Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Adjusting the rate at which irrigation water is applied to the available water capacity and the rate of water intake helps to prevent overirrigation and the leaching of plant nutrients.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 57-Labenzo silt loam, 0 to 1 percent slopes

### Composition

Labenzo soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Labenzo Soil

Position on landscape: Stream terraces
Elevation: About 4,900 feet
Average annual air temperature: About 43 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 13 inches
Typical profile:
0 to 12 inches-grayish brown and brown silt loam
12 to 24 inches-brown silt loam
24 to 27 inches-brown fine sandy loam
27 to 60 inches-grayish brown extremely gravelly sand
Other characteristics: This unit was covered with floodwater during the flooding of the Teton River in June 1976. The upper 12 to 36 inches varies as a result of the flood damage and the subsequent reclamation. The Labenzo soil in this survey area is adjacent to areas of Annis, Bannock, and Blackfoot soils, Haplaquolls, and Wardboro and Withers soils in Madison County. All of these soils were extensively reworked by the floodwater.
Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the upper 27 inches; very rapid below a depth of 27 inches
Available water capacity: Moderate
Runoff: Very slow
Hazard of water erosion: Slight
Depth to the water table (artificially lowered): About 60 inches
Flooding: Can occur in areas adjacent to the north and south forks of the Teton River as a result of ice jams upstream

### Inclusions

St. Anthony soils (10 percent); Riverwash deposited during the flooding of the Teton River (5 percent)

#### Use and Management

Major uses: Irrigated cropland, windbreaks
Major management factors: Gravel in some areas, flooding in some areas

#### Irrigated cropland

Suitable crops: Wheat, barley, alfalfa, pasture, potatoes
General management considerations:
• The best suited irrigation method is a sprinkler system.
• A plowpan forms easily if this unit is tilled when wet.
• Water should be applied in amounts large enough to wet the root zone but small enough to prevent the leaching of plant nutrients.
• Returning crop residue to the soil and keeping tillage at a minimum help to prevent compaction of the soil.

#### Windbreaks

Trees suitable for planting: Russian olive, golden willow, green ash, Rocky Mountain juniper, blue spruce Shrubs suitable for planting: Lilac, Peking cotoneaster, Nanking cherry, Siberian peashrub, European privet

### Capability Classification

IIIc, irrigated

## 58-Lavacreek-Rin complex, 6 to 20 percent slopes

### Composition

Lavacreek gravelly loam and similar inclusions-55 percent
Rin silt loam and similar inclusions-25 percent
Contrasting inclusions-20 percent

### Characteristics of the Lavacreek Soil

Position on landscape: Hillsides
Elevation: About 5,500 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 65 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 11 inches-dark brown gravelly loam
11 to 30 inches-yellowish brown very gravelly loam

30 to 49 inches-light brown very gravelly loam
49 to 60 inches-pink extremely gravelly sandy loam in which the rock fragments are dominantly cinders

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper 11 inches; rapid below a depth of 11 inches
Available water capacity: High
Potential rooting depth: 60 inches or more
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Rin Soil

Position on landscape: Hillsides
Elevation: About 5,500 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 65 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 60 inches-silt loam that is yellowish brown in the upper part and light yellowish brown in the lower part

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Lavacreek soil but have 10 to 30 percent pebbles and cobbles between depths of 10 and 40 inches (10 percent); soils that are similar to the Lavacreek soil but have soft rhyolitic bedrock at a depth of 10 to 40 inches (5 percent); Kucera and Rexburg silt foams (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Gravel and cobbles in some areas, water erosion, slope, a short growing season
Suitable crops: Irrigated and nonirrigated barley, alfalfa, and pasture
General management considerations:

- Production is limited mainly by the short growing season.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and seeding a permanent cover of grasses and legumes reduce the risk of erosion, maintain tilth, and increase the rate of water intake.

### Capability Classification

IVe, irrigated; IVc, nonirrigated

## 59-Lavacreek-Sadorus complex, 1 to 40 percent slopes

### Composition

Lavacreek gravelly loam and similar inclusions-60 percent
Sadorus gravelly sandy loam and similar inclusions-15 percent
Contrasting inclusions-25 percent

### Characteristics of the Lavacreek Soil

Position on landscape: North- and east-facing hillsides
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 65 days
Average annual precipitation: About 20 inches
Slope: 6 to 40 percent
Typical profile:
0 to 11 inches-dark brown gravelly loam
11 to 30 inches-yellowish brown very gravelly loam
30 to 49 inches-light brown very gravelly loam
49 to 60 inches-pink extremely gravelly sandy loam in which the rock fragments are dominantly ash and cinders

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper 11 inches; moderately rapid below a depth of 11 inches
Available water capacity: High
Runoff: Rapid or very rapid
Hazard of water erosion: Severe or very severe

### Characteristics of the Sadorus Soil

Position on landscape: Canyonsides, hillsides
Elevation: About 5,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 65 days
Average annual precipitation: About 20 inches
Slope: 1 to 40 percent
Typical profile:
0 to 2 inches-dark grayish brown gravelly sandy loam
2 to 14 inches-dark brown gravelly sandy loam
14 inches-fractured rhyolitic tuff

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low

Potential rooting depth: 10 to 20 inches
Runoff: Very rapid
Hazard of water erosion: Severe or very severe

### Inclusions

Soils that are similar to the Lavacreek soil but have 18 to 25 percent clay between depths of 10 and 40 inches (10 percent); soils that are similar to the Lavacreek soil but have less. than 35 percent coarse fragments throughout (5 percent); soils that are similar to the Lavacreek soil but have fractured rhyolitic tuff at a depth of 20 to 40 inches (5 percent); Rock outcrop (5 percent)

### Use and Management

Major uses: Woodland, grazable woodland, rangeland Major management factors: Water erosion, slope, depth to bedrock in some areas, a short growing season

**Woodland (Lavacreek soil)**

Common forest overstory plants: Quaking aspen
Mean site index for quaking aspen: 50
Estimated average annual production per acre: 0.2 cord from a stand of trees that average 7 inches in diameter at a height of 4 feet or about 25 cubic feet from a stand of trees 80 years old

**Grazable understory (Lavacreek soil)**

Production of forage in an average year: About 1,400 pounds per acre
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Grazing of the forage by livestock is limited by the slope and the brushy understory in some areas.

**Rangeland (Sadorus soil)**

Dominant vegetation in potential natural plant community: Mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, arrowleaf balsamroot
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

### Capability Classification

Vle, nonirrigated

## 60-Lavacreek-Targhee complex, 12 to 60 percent slopes

### Composition

Lavacreek gravelly loam and similar inclusions-40 percent
Targhee loam and similar inclusions-35 percent
Contrasting inclusions-25 percent

### Characteristics of the Lavacreek Soil

Position on landscape: Canyonsides, hillsides
Elevation: About 5,600 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Slope: 12 to 45 percent
Typical profile:
0 to 11 inches-dark brown gravelly loam
11 to 30 inches-yellowish brown very gravelly loam
30 to 49 inches-light brown very gravelly loam
49 to 60 inches-pink extremely gravelly sandy loam in which the rock fragments are dominantly cinders
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper 11 inches; moderately rapid below a depth of 11 inches
Available water capacity: High
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Targhee Soil

Position on landscape: Hillsides
Elevation: About 6,500 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 25 inches
Slope: 12 to 60 percent
Typical profile:
0 to 5 inches-pale brown loam
5 to 14 inches-light gray gravelly sandy loam
14 to 30 inches-white very gravelly sandy loam
30 to 36 inches-white extremely cobbly sand
36 inches-rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Lavacreek soil but have 18 to 25 percent clay between depths of 10 and 40 inches (10 percent); soils that are similar to the Lavacreek soil but have less than 35 percent coarse fragments throughout (5 percent); soils that are similar to the Targhee soil but are on ridgetops and have slopes of less than 12 percent (5 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Woodland
Major management factors: Water erosion, slope, depth to bedrock in some areas, a short growing season

**Woodland**

Common forest overstory plants: Douglas fir, quaking aspen
Mean site index for quaking aspen: Lavacreek soil-50
Estimated average annual production per acre of quaking aspen: 25 cubic feet from a stand of trees 80 years old
Mean site index for Douglas fir: Targhee soil-50
Estimated average annual production per acre of Douglas fir: About 38 cubic feet from a stand of trees 60 years old
Common forest understory plants: Pine reedgrass, mountain brome, Woods rose, mountain snowberry General management considerations.
• Adequately designed road drainage systems reduce the risk of erosion.
• The slope limits the kinds of equipment that can be used in forest management.

### Capability Classification

VIIe, nonirrigated

## 61-Lionhead gravelly loam, 20 to 55 percent slopes

### Composition

Lionhead soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Lionhead Soil

Position on landscape: Mountainsides
Elevation: About 7,800 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 25 inches
Typical profile:
0 to 9 inches-brown gravelly loam
9 to 26 inches-brown very gravelly loam
26 to 34 inches-pale brown very cobbly loam
34 to 46 inches-yellowish brown extremely gravelly sandy loam
46 to 60 inches-light yellowish brown extremely cobbly sandy loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper 34 inches; rapid below a depth of 34 inches
Available water capacity: Moderate
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Lionhead soil but have a calcium carbonate equivalent of more than 15 percent at a depth of 20 to 40 inches (10 percent); Rock outcrop and soils that are similar to the Lionhead soil but are less than 40 inches deep over bedrock (5 percent)

### Use and Management

Major uses: Rangeland, summer homesites
Major management factors: Gravel, cobbles, and stones; slope; water erosion; permeability; a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Idaho fescue, bluebunch wheatgrass, mountain brome, mountain big sagebrush
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Grazing of the forage by livestock is limited by the slope.
• Seeding of suitable species to improve the range is limited by the slope and the severe hazard of erosion.

**Building site development**

General management considerations.
• Excavation is hampered by the slope and the stones and cobbles in the soil.
• Road cutbanks can cave in.
• The slope and the rapid permeability severely limit the use of this unit as a site for septic tank absorption fields.
• Stabilizing disturbed areas reduces the risk of erosion and lowers the cost of maintenance.

### Capability Classification

VIIe, nonirrigated

## 62-Lostine silt loam, 1 to 4 percent slopes

### Composition

Lostine soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation. About 5,500 feet
Average annual air temperature: About 41 degrees F

Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability. Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Marotz silt loam (5 percent); Kucera silt loam (5 percent); soils that are similar to Marotz soils but are on the bottom of draws and have more than 15 percent coarse fragments (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factor: Water erosion
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 63-Lostine-Marotz-Marystown silt loams, 8 to 12 percent slopes

### Composition

Lostine soil and similar inclusions-35 percent
Marotz soil and similar inclusions-30 percent
Marystown soil and similar inclusions-25 percent
Contrasting inclusions-10 percent

#### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Marotz Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 16 inches-dark grayish brown silt loam
16 to 27 inches-brown silt loam
27 to 38 inches-yellowish brown gravelly silt loam
38 to 49 inches-yellowish brown gravelly silty clay loam
49 to 60 inches-yellowish brown gravelly clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile. -
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Marotz and Marystown soils but have more than 35 percent rock fragments between depths of 20 and 60 inches (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion; gravel, cobbles, and stones in some areas; slope
Suitable crops: Irrigated and nonirrigated barley and alfalfa
General management considerations:
- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

lVe, irrigated and nonirrigated

## 64-Lostine-Marystown silt loams, 4 to 8 percent slopes

### Composition

Lostine soil and similar inclusions-45 percent
Marystown soil and similar inclusions-40 percent
Contrasting inclusions-15 percent

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,550 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation. About 18 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,550 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Kucera silt loam (5 percent); Marotz silt loam and similar soils that have a surface layer of gravelly silt loam and are in areas north of the Henrys Fork of the Snake River (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion; gravel, cobbles, and stones
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa; nonirrigated clover for use as green manure
General management considerations:
- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IIIe, irrigated and nonirrigated

## 65-Maim fine sandy loam, 1 to 6 percent slopes

### Composition

Malm soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Maim Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet

Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 6 inches-brown fine sandy loam
6 to 36 inches-pale brown fine sandy loam
36 inches-basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Maim soil but have bedrock at a depth of 40 to 60 inches (5 percent); soils that are similar to the Maim soil but are 10 to 20 inches deep over bedrock and have 30 to 60 percent coarse fragments throughout (5 percent); Wolverine fine sand (5 percent); Rock outcrop (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland, windbreaks
Major management factors: Depth to bedrock in some areas, wind erosion, risk of seepage

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Indian ricegrass, needleandthread, Wyoming big sagebrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the depth to bedrock in some areas.
•The suitability for range seeding is fair.
• Seepage limits the construction of livestock watering ponds and other water impoundments.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
•Improving the plant cover reduces the risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:
• Maintaining crop residue on the surface and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Honeylocust, idahybrid poplar, Rocky Mountain juniper
Shrubs suitable for planting. Siberian peashrub, lilac
General management considerations:
• Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.
• Irrigation is needed when the trees and shrubs are planted and during dry periods.

**Capability Classification**

IVe, irrigated; VIe, nonirrigated

## 66-Malm-Juniperbute complex, 1 to 12 percent slopes

### Composition

Malm loamy fine sand and similar inclusions-45 percent
Juniperbute fine sand and similar inclusions-30 percent
Contrasting inclusions-25 percent

**Characteristics of the Malm Soil**

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 12 inches T
ypical profile:
0 to 6 inches-brown loamy fine sand
6 to 15 inches-brown fine sandy loam
15 to 36 inches-pale brown and very pale brown fine sandy loam
36 inches-basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Juniperbute Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 12 inches
Typical profile:
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Slow

Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Maim soil but have bedrock within a depth of 20 inches (10 percent); Rock outcrop (10 percent); Wolverine fine sand, bedrock substratum (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, depth to bedrock in some areas, available water capacity
Dominant vegetation in potential natural plant community: Needleandthread, Indian ricegrass, thickspike wheatgrass, basin big sagebrush, antelope bitterbrush
General management considerations:

- Production is limited mainly by the low available water capacity in some areas.
- Seeding of suitable species to improve the range is limited by the severe hazard of wind erosion.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
- Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIIe, nonirrigated

## 67-Malm-Rock outcrop complex, 0 to 12 percent slopes

### Composition

Malm loamy fine sand and similar inclusions-45 percent
Rock outcrop-30 percent
Contrasting inclusions-25 percent

### Characteristics of the Malm Soil

Position on landscape: Basalt plains
Elevation: About 5,100 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 6 inches-brown loamy fine sand
6 to 15 inches-brown fine sandy loam
15 to 36 inches-pale brown and very pale brown fine sandy loam
36 inches-basalt
Depth class. Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Rock Outcrop

Position on landscape: Basalt plains
Kind of material: Exposed basalt

### Inclusions

Modkin loamy sand (10 percent); Wolverine fine sand, bedrock substratum (5 percent); soils that are similar to the Malm soil but have 15 to 60 percent gravel or cobbles throughout (5 percent); soils that are similar to the Malm soil but have bedrock within a depth of 20 inches (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, depth to bedrock, Rock outcrop
Dominant vegetation in potential natural plant community: Indian ricegrass, needleandthread, basin big sagebrush
General management considerations:

- Seeding of suitable species to improve the range is limited by the hazard of wind erosion and the areas of Rock outcrop.
- Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
- Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VII, nonirrigated

## 68-Malm-Wolverine sands, 0 to 12 percent slopes

### Composition

Malm soil and similar inclusions-45 percent
Wolverine soil and similar inclusions-30 percent
Contrasting inclusions-25 percent

### Characteristics of the Malm Soil

Position on landscape: Basalt plains
Elevation: About 5,000 feet
Average annual air temperature: About 42 degrees F

Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 5 inches-grayish brown sand
5 to 17 inches-grayish brown loamy sand
17 to 22 inches-pale brown fine sandy loam
22 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Wolverine Soil

Position on landscape: Basalt plains, stabilized dunes
Elevation: About 5,000 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 6 inches-grayish brown sand
6 to 60 inches-grayish brown and light grayish brown sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Moderate
Runoff: Very slow
Hazard of water erosion: None
Hazard of wind erosion: Very severe

### Inclusions

Soils that are similar to the Wolverine soil but have bedrock at a depth of 40 to 60 inches (15 percent); soils that are similar to the Malm soil but have bedrock within a depth of 20 inches (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock in some areas, wind erosion, available water capacity in some areas
Dominant vegetation in potential natural plant community: Basin big sagebrush, Indian ricegrass, needleandthread, antelope bitterbrush
General management considerations.
• Seeding of suitable species is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIIe, nonirrigated

## 69-Marotz silt loam, 1 to 4 percent slopes

### Composition

Marotz soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Marotz Soil

Position on landscape: Plains
Elevation: About 5,500 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 16 inches-dark grayish brown silt loam
16 to 27 inches-brown silt loam
27 to 38 inches-yellowish brown gravelly silt loam
38 to 49 inches-yellowish brown gravelly silty clay loam
49 to 60 inches-yellowish brown gravelly clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Rock outcrop and soils that are similar to the Marotz soil but have boulders at the surface (5 percent); soils that are similar to the Marotz soil but have more than 35 percent gravel, stones, and boulders between depths of 27 and 60 inches (10 percent); Marystown silt loam (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factor: Permeability
Suitable crops: Irrigated potatoes, barley, wheat, peas, and alfalfa; nonirrigated barley and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 70-Marotz silt loam, 4 to 8 percent slopes

### Composition

Marotz soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Marotz Soil

Position on landscape: Plains
Elevation: About 5,500 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 16 inches-dark grayish brown silt loam
16 to 27 inches-brown silt loam
27 to 38 inches-yellowish brown gravelly silt loam
38 to 49 inches-yellowish brown gravelly silty clay loam
49 to 60 inches-yellowish brown gravelly clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Rock outcrop and soils that are similar to the Marotz soil but have boulders at the surface (5 percent); Marystown and Greentimber silt loams (5 percent); soils that are similar to the Marotz soil but have 35 to 50 percent gravel, cobbles, and stones between depths of 27 and 60 inches (5 percent); soils that are similar to the Marotz soil but have slopes of 8 to 20 percent (5 percent)

#### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, permeability
Suitable crops: Irrigated barley, wheat, peas, and alfalfa; nonirrigated barley and alfalfa
General management considerations:

- The best suited irrigation method is a sprinkler system.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways and a permanent cover of grasses and legumes reduce the risk of erosion.

### Capability Classification

IVe, irrigated; IIIc, nonirrigated

## 71-Marotz-Marystown-Lostine silt loams, 12 to 20 percent slopes

### Composition

Marotz soil and similar inclusions-40 percent
Marystown soil and similar inclusions-25 percent
Lostine soil and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Marotz Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Slope: 12 to 20 percent
Typical profile:
0 to 16 inches-dark grayish brown silt loam
16 to 27 inches-brown silt loam
27 to 38 inches-yellowish brown gravelly silt loam
38 to 49 inches-yellowish brown gravelly silty clay loam
49 to 60 inches-yellowish brown gravelly clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Slope: 12 to 20 percent
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high

Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Slope: 12 to 15 percent
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Marotz and Marystown soils but have more than 35 percent rock fragments between depths of 20 and 60 inches (15 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion; gravel, cobbles, and stones in some areas; slope
Suitable crops: Barley, alfalfa
General management considerations:
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways and a permanent cover of grasses and legumes reduce the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 72-Marystown silt loam, 1 to 4 percent slopes

### Composition

Marystown soil and similar inclusions-90 percent
Contrasting inclusion-10 percent

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,500 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusion

Robinlee silt loam (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factor: Water erosion
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa; nonirrigated clover for use as green manure
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 73-Marystown silt loam, 4 to 8 percent slopes

### Composition

Marystown soil and similar inclusions-90 percent
Contrasting inclusions-10 percent

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 40 inches-yellowish brown silty clay loam

40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Robinlee silt loam (5 percent); Marotz silt loam (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, slope
Suitable crops: Irrigated barley and alfalfa; nonirrigated barley, alfalfa, and potatoes; nonirrigated clover for use as green manure
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IIIe, irrigated and nonirrigated

## 74-Marystown silt loam, 8 to 12 percent slopes

### Composition

Marystown soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,500 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Marotz silt loam (15 percent); soils that are similar to the Marotz soil but have boulders and stones at a depth of 10 inches or more (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Cobbles and stones in some areas, water erosion, slope
Suitable crops: Irrigated and nonirrigated barley and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways and a permanent cover of grasses and legumes reduce the risk of erosion.

### Capability Classification

IVe, irrigated and nonirrigated

## 75-Marystown-Lostine silt loams, 1 to 4 percent slopes

### Composition

Marystown soil and similar inclusions-50 percent
Lostine soil and similar inclusions-40 percent
Contrasting inclusions-10 percent

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches

Typical profile:
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Lostine Soil

Position on landscape: Loessal plains
Elevation: About 5,600 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 20 inches-dark grayish brown silt loam
20 to 36 inches-brown silt loam
36 to 60 inches-pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Marystown and Lostine soils but have 15 to 45 percent coarse fragments at a depth of 40 to 60 inches (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: None
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa; nonirrigated clover for use as green manure
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 76-Marystown-Robinlee-Rexburg, hardpan substratum silt loams, 1 to 4 percent slopes

### Composition

Marystown soil and similar inclusions-40 percent
Robinlee soil and similar inclusions-25 percent
Rexburg soil and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Marystown Soil

Position on landscape: Loessal plains
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 17 inches
Typical profile.
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 40 inches-yellowish brown silty clay loam
40 to 60 inches-light yellowish brown silty clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Robinlee Soil

Position on landscape: Loessal plains
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark brown silt loam
11 to 23 inches-yellowish brown silt loam
23 to 41 inches-yellowish brown silty clay loam
41 to 52 inches-light yellowish brown loam
52 to 60 inches-dark yellowish brown loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Rexburg Soil

Position on landscape: Loessal plains
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 16 inches

Typical profile:
0 to 12 inches-grayish brown silt loam
12 to 31 inches-brown silt loam
31 to 42 inches-brown and pale brown silt loam
42 to 60 inches-hardpan
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Rexburg soil but have 18 to 34 percent clay at a depth of 20 to 40 inches (5 percent); Marotz silt loam (5 percent); soils that are similar to Marotz silt loam but have lime at a depth of 20 to 40 inches (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland Major management factor: Depth to the hardpan in some areas
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 77-Modkin loamy sand, 1 to 4 percent slopes

### Composition

Modkin soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Modkin Soil

Position on landscape: Basalt plains
Elevation: About 5,050 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 5 inches-brown loamy sand
5 to 13 inches-pale brown fine sandy loam
13 to 36 inches-fine sandy loam that is very pale brown in the upper part and white in the lower part
36 inches-lime-coated basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Grassyridge loamy sand (5 percent); Diston loamy sand (5 percent); soils that are similar to Malm loamy sand but have 20 percent cobbles and have bedrock at a depth of 10 to 20 inches (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland, windbreaks
Major management factors: Depth to bedrock, wind erosion

**Rangeland**

Dominant vegetation in potential natural plant community: Needleandthread, Indian ricegrass, yellow wildrye, thickspike wheatgrass, arrowleaf balsam root, basin big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface and keeping tillage to a minimum reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Golden willow, Russian olive, idahybrid poplar, Rocky Mountain juniper, Norway spruce
Shrubs suitable for planting: Nanking cherry, lilac, Peking cotoneaster
General management considerations:
• Windbreaks help to limit soil losses, maintain optimum

crop yields, and protect farm and ranch buildings.

• Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

IVe, irrigated; VIIe, nonirrigated

## 78-Modkin loamy sand, 4 to 20 percent slopes

### Composition

Modkin soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Modkin Soil

Position on landscape: Basalt plains
Elevation: About 5,080 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 10 inches
Typical profile:
0 to 5 inches-brown loamy sand
5 to 13 inches-pale brown fine sandy loam
13 to 36 inches-fine sandy loam that is very pale brown in the upper part and white in the lower part
36 inches-lime-coated basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

#### Inclusions

Grassyridge sand (5 percent); Diston loamy sand (5 percent); Rock outcrop and areas of shallow stony loamy sand (5 percent); soils that are similar to the Modkin soil but are cobbly or stony and are as much as 60 inches deep over bedrock (5 percent)

#### Use and Management

Major uses: Rangeland, irrigated cropland, windbreaks
Major management factors: Depth to bedrock, wind erosion, Rock outcrop in some areas

**Rangeland**

Dominant vegetation in potential natural plant community: Needleandthread, Indian ricegrass, yellow wildrye, arrowleaf balsamroot, basin big sagebrush, western wheatgrass

General management considerations:
• Seeding of suitable species to improve the range is limited by the hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations.
• The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface, seeding a permanent cover of grasses and legumes, and keeping tillage to a minimum reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Golden willow, Russian olive, idahybrid poplar, Rocky Mountain juniper, Norway spruce
Shrubs suitable for planting: Nanking cherry, lilac, Peking cotoneaster
General management considerations:
• Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.
• Irrigation is needed when the trees and shrubs are planted and during dry periods.

### Capability Classification

IVe, irrigated; VIIe, nonirrigated

## 79-Nayrib-Stipe complex, 1 to 6 percent slopes

### Composition

Nayrib very cobbly fine sandy loam and similar inclusions-45 percent
Stipe fine sandy loam and similar inclusions-40 percent
Contrasting inclusions-15 percent

### Characteristics of the Nayrib Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-brown very cobbly fine sandy loam
8 inches-unweathered basalt
Depth class: Very shallow
Drainage class: Well drained
Permeability: Moderately rapid

Available water capacity: Very low
Potential rooting depth: 6 to 10 inches
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Slight

### Characteristics of the Stipe Soil

Position on landscape: Basalt plains
Elevation: About 5,200 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 12 inches-brown fine sandy loam
12 to 34 inches-brown very fine sandy loam
34 to 36 inches-light gray very fine sandy loam
36 inches-unweathered basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Nayrib soil but are on ridges and have less than 35 percent coarse fragments throughout (5 percent); soils that are similar to the Stipe soil but have more than 18 percent clay between depths of 20 and 40 inches (5 percent); soils that are similar to the Stipe soil but have more than 15 percent coarse fragments throughout (5 percent)

### Use and Management

Major uses: Rangeland, pasture
Major management factors: Gravel, cobbles, and stones in some areas, depth to bedrock in some areas

**Rangeland**

Dominant vegetation in potential natural plant community: Mountain big sagebrush, bluebunch wheatgrass, needleandthread, arrowleaf balsamroot, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the coarse fragments on or near the surface and the areas of very shallow soils.

**Irrigated pasture**

General management considerations:
• Tillage is restricted by the coarse fragments on or near the surface and the areas of very shallow soils.

### Capability Classification

VIs, irrigated; VIIs, nonirrigated

## 80-Nayrib-Stipe-Jipper, clayey substratum complex, 1 to 6 percent slopes

### Composition

Nayrib very cobbly fine sandy loam and similar inclusions-40 percent
Stipe fine sandy loam and similar inclusions-25 percent
Jipper fine sandy loam, clayey substratum, and similar inclusions-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Nayrib Soil

Position on landscape: Ridgetops
Elevation: About 5,010 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile. -
0 to 8 inches-brown very cobbly fine sandy loam
8 inches-unweathered rhyolite
Depth class: Very shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 5 to 10 inches
Runoff: Very slow
Hazard of water erosion: Slight

### Characteristics of the Stipe Soil

Position on landscape: Hillsides
Elevation: About 5,000 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 36 inches-brown fine sandy loam
36 inches-rhyolite
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Jipper Soil

Position on landscape: Swales
Elevation: About 5,010 feet

Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-grayish brown fine sandy loam
8 to 45 inches-fine sandy loam that is brown in the upper part and pale brown in the lower part
45 to 55 inches-light reddish brown sandy clay loam
55 inches-hard rhyolite
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid in the upper 45 inches; moderate below a depth of 45 inches
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Stipe and Jipper soils but have 25 to 35 percent rock fragments throughout (5 percent); soils that are similar to the Nayrib, Stipe, and Jipper soils but have a hardpan (5 percent); Robinlee silt loam (5 percent)

### Use and Management

Major uses: Nayrib soil-rangeland; Stipe and Jipper soils-irrigated and nonirrigated cropland, rangeland
Major management factors: Available water capacity in some areas, cobbles and stones in some areas, depth to bedrock in some areas, wind erosion

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, arrowleaf balsamroot, mountain big sagebrush
General management considerations:
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
• Seeding of suitable species to improve the range is limited by the depth to bedrock and available water capacity in some areas.

**Cropland**

Suitable crops: Irrigated and nonirrigated wheat, barley, and alfalfa
General management considerations:
• Cropping the better suited areas is difficult because of the irregular pattern in which they occur with areas of the more poorly suited Nayrib soil.
•A tillage pan forms if the soil is excessively cultivated.
• Chiseling or subsoiling stubble fields on the contour or across the slope in the fall reduces the risk of erosion, maintains tilth, and increases the rate of water intake.

### Capability Classification

Nayrib soil-VIIs; Stipe and Jipper soils-IIIs, irrigated; IVe, nonirrigated

## 81-Pits, gravel

Position on landscape: Basalt plains, alluvial flood plains, and river terraces
Kind of material: Open excavations from which volcanic cinders on basalt plains and gravel and sand on alluvial flood plains and river terraces are removed
Agricultural value: None
Capability classification: Not assigned

## 82-Povey-Split butte-Rock outcrop complex, 5 to 20 percent slopes

### Composition

Povey very gravelly loam and similar inclusions-50 percent
Splitbutte very gravelly loam and similar inclusions-25 percent
Rock outcrop-15 percent
Contrasting inclusions-10 percent

### Characteristics of the Povey Soil

Position on landscape: Draws and ridgetops on rhyolitic plains
Elevation: About 6,300 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 55 days
Average annual precipitation. About 20 inches
Rock fragments on surface: 35 to 55 percent gravel, cobbles, and stones
Typical profile:
0 to 6 inches-dark brown very gravelly loam
6 to 19 inches-brown and dark brown very gravelly loam
19 to 60 inches-brown extremely gravelly loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Splitbutte Soil

Position on landscape: Ridges, shoulder slopes, and hillsides on rhyolitic plains
Elevation: About 6,300 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 55 days
Average annual precipitation: About 20 inches
Rock fragments on surface: 35 to 45 percent gravel and cobbles
Typical profile:
0 to 4 inches-dark brown very gravelly loam
4 to 12 inches-dark brown extremely gravelly loam
12 to 25 inches-yellowish brown extremely gravelly loam
25 inches-fractured rhyolite
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rock Outcrop

Position on landscape: Shoulder slopes, ridgetops, hillsides
Kind of material: Exposed rhyolite

### Inclusions

Soils that are similar to the Povey soil but have a more clayey layer at a depth of 20 to 45 inches (5 percent); soils that are similar to the Povey soil but have less than 35 percent gravel at a depth of 20 to 40 inches (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Rock outcrop, a short growing season
Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, Columbia needlegrass, arrowleaf balsamroot, mountain big sagebrush
Common invading species: Snowbrush ceanothus
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the short growing season and the areas of Rock outcrop.
• Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
• The establishment and growth of plants are limited by the invasion of snowbrush ceanothus.
• Grazing should be delayed until the soil is adequately drained and is firm enough to withstand trampling by livestock.
• The suitability of this unit as a site for livestock watering ponds is poor.
• Seepage limits the construction of livestock watering ponds and other water impoundments.

### Capability Classification

Vle, nonirrigated

## 83-Raynoldson gravelly loam, 2 to 15 percent slopes

### Composition

Raynoldson soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Raynoldson Soil

Position on landscape: Fan terraces, outwash plains
Elevation: About 6,700 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 12 inches-dark yellowish brown gravelly loam
12 to 18 inches-dark yellowish brown very gravelly loam
18 to 32 inches-variegated (dominantly dark yellowish brown) extremely gravelly sandy loam
32 to 60 inches-variegated (dominantly dark yellowish brown) extremely gravelly loamy sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Runoff: Severe
Hazard of water erosion: Rapid

### Inclusions

Soils that are similar to the Raynoldson soil but have less than 35 percent gravel or more than 28 percent clay, or both, between depths of 10 and 40 inches (15 percent); soils that are similar to the Raynoldson soil but do not have a layer of lime accumulation between depths of 10 and 60 inches and are on glacial moraines and mountainsides in the upper Howard Creek area (5 percent)

### Use and Management

Major uses: Rangeland, pasture, summer homesites Major management factors: Water erosion, frost action,

risk of seepage, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Idaho fescue, slender wheatgrass, mountain brome, mountain big sagebrush

General management considerations:

- A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Improving the plant cover reduces the risk of erosion.

**Pasture**

General management considerations:

- The very short growing season limits production.

**Building site development**

General management considerations:

- The risk of seepage and the hazard of water pollution limit this unit as a site for septic tank absorption fields.
- Local roads and streets may require a special base to prevent the damage caused by frost heaving.
- Stabilizing disturbed areas reduces the risk of erosion and the cost of maintenance.

### Capability Classification

VIe, nonirrigated

## 84-Rexburg-Ririe silt loams, 1 to 4 percent slopes

### Composition

Rexburg soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Rexburg Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 5 inches-dark grayish brown silt loam
5 to 14 inches-grayish brown silt loam
14 to 25 inches-light brownish gray silt loam
25 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Ririe Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile.
0 to 8 inches-dark grayish brown silt loam
8 to 11 inches-yellowish brown silt loam
11 to 20 inches-very pale brown silt loam
20 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Lostine silt loam on north- and east-facing slopes and in drainageways (10 percent); Rexburg and Ririe silt loams, bedrock substratum (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factor: Water erosion
Suitable crops: Irrigated wheat, barley, alfalfa, peas, and potatoes; nonirrigated wheat, barley, and alfalfa
General management considerations:

- Unless water is available for irrigation, a cropping system in which small grain is grown year after year, minimum tillage, and intensive crop residue management are needed.
- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 85-Rexburg-Ririe silt loams, 4 to 12 percent slopes

### Composition

Rexburg soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

Characteristics of the Rexburg Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 5 inches-dark grayish brown silt loam
5 to 14 inches-grayish brown silt loam
14 to 25 inches-light brownish gray silt loam 25 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

Characteristics of the Ririe Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F Frost-free period: About 90 days Average annual precipitation: About 15 inches Typical profile:
0 to 8 inches-dark grayish brown silt loam
8 to 11 inches-yellowish brown silt loam 11 to 20 inches-very pale brown silt loam
20 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

Inclusions

Lostine silt loam on north- and east-facing slopes and in drainageways (10 percent); Rexburg and Ririe silt loams, bedrock substratum (5 percent)

Use and Management

Major use: Irrigated and nonirrigated cropland Major management factor: Water erosion
Suitable crops: Irrigated wheat, barley, alfalfa, and potatoes; nonirrigated wheat, barley, and alfalfa
General management considerations:

- Unless water is available for irrigation, a cropping system in which small grain is grown year after year, minimum tillage, and intensive crop residue management are needed.
- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, irrigated; Ille, nonirrigated

## 86-Rexburg-Ririe silt loams, 12 to 20 percent slopes

### Composition

Rexburg soil and similar inclusions-50 percent Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Rexburg Soil

Position on landscape: Loessal plains
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 5 inches-dark grayish brown silt loam
5 to 14 inches-grayish brown silt loam
14 to 25 inches-light brownish gray silt loam
25 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Ririe Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-dark grayish brown silt loam
8 to 11 inches-light yellowish brown silt loam
11 to 20 inches-very pale brown silt loam
20 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate

Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to Rexburg and Ririe silt loams, bedrock substratum, but have bedrock at a depth of 20 to 60 inches (10 percent); soils that are similar to the Rexburg and Ririe soils but have slopes of more than 20 percent (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope
Suitable crops: Barley, wheat, alfalfa
General management considerations:

- This unit is not suited to cropping year after year because of the limited supply of soil moisture.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways and a permanent cover of grasses and legumes reduce the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 87-Rexburg-Ririe silt loams, bedrock substratums, 1 to 4 percent slopes

### Composition

Rexburg soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

#### Characteristics of the Rexburg Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile. -
0 to 29 inches-brown silt loam
29 to 39 inches-light gray silt loam
39 to 47 inches-pale brown silt loam
47 inches-rhyolite
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Moderate

#### Characteristics of the Ririe Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 10 inches-grayish brown silt loam
10 to 15 inches-pale brown silt loam
15 to 46 inches-very pale brown silt loam
46 to 57 inches-white silt loam
57 inches-hard rhyolitic tuff
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Soils that are similar to the Rexburg and Ririe soils but have bedrock at a depth of 20 to 40 inches (10 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Depth to bedrock in some areas, water erosion
Suitable crops: Irrigated wheat, barley, alfalfa, and potatoes; nonirrigated wheat and barley
General management considerations:

- Unless water is available for irrigation, a cropping system in which small grain is grown year after year, minimum tillage, and intensive crop residue management are needed.
- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 88-Rexburg-Ririe silt loams, bedrock substratums, 4 to 12 percent slopes

### Composition

Rexburg soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Rexburg Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 29 inches-brown silt loam
29 to 39 inches-light gray silt loam
39 to 47 inches-pale brown silt loam
47 inches-rhyolite
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Ririe Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 10 inches-grayish brown silt loam
10 to 15 inches-pale brown silt loam
15 to 46 inches-very pale brown silt loam
46 to 57 inches-white silt loam
57 inches-hard rhyolitic tuff
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Rexburg and Ririe soils but have bedrock at a depth of 20 to 40 inches (10 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Depth to bedrock in some areas, water erosion, slope
Suitable crops: Irrigated wheat, barley, alfalfa, and potatoes; nonirrigated wheat and barley
General management considerations:
- Unless water is available for irrigation, a cropping system in which small grain is grown year after year, minimum tillage, and intensive crop residue management are needed.
- The best suited irrigation method is a sprinkler system.
- Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, irrigated; Ille, nonirrigated

## 89-Rexburg-Ririe silt loams, bedrock substratums, 12 to 20 percent slopes

### Composition

Rexburg soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Rexburg Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile. -
0 to 29 inches-brown silt loam
29 to 39 inches-light gray silt loam
39 to 47 inches-pale brown silt loam
47 inches-rhyolite
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Ririe Soil

Position on landscape: Plains, loess-covered foothills
Elevation: About 5,400 feet

Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 10 inches-grayish brown silt loam
10 to 15 inches-pale brown silt loam
15 to 46 inches-very pale brown silt loam
46 to 57 inches-white silt loam
57 inches-hard rhyolitic tuff
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Rexburg and Ririe soils but have bedrock at a depth of 20 to 40 inches (10 percent); Rock outcrop (5 percent)

### Use and Management

Major use: Non irrigated cropland
Major management factors: Depth to bedrock in some areas, water erosion, slope
Suitable crops: Wheat, barley
General management considerations:
• This unit is not suited to cropping year after year because of the limited supply of soil moisture.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways and a permanent cover of grasses and legumes reduce the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 90-Rexburg, hardpan substratum-Rexburg silt loams, 1 to 4 percent slopes

### Composition

Rexburg soil, hardpan substratum, and similar inclusions-45 percent
Rexburg soil and similar inclusions-45 percent
Contrasting inclusions-10 percent

### Characteristics of the Rexburg Soil, Hardpan Substratum

Position on landscape: Loess-covered foothills
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 12 inches-grayish brown silt loam
12 to 31 inches-brown silt loam
31 to 37 inches-light gray silt loam
37 to 42 inches-pale brown silt loam
42 inches-cemented hardpan
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Moderate

### Characteristics of the Rexburg Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 5 inches-dark grayish brown silt loam
5 to 14 inches-grayish brown silt loam
14 to 25 inches-light brownish gray silt loam
25 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Rexburg silt loam, bedrock substratum (5 percent); Ririe silt loam (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Depth to the hardpan in some areas, water erosion
Suitable crops: Irrigated potatoes, wheat, barley, alfalfa, and peas; nonirrigated wheat, barley, and alfalfa
General management considerations. -
•Crops can be irrigated if water is available.
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 91-Rexburg, hardpan substratum-Rexburg silt loams, 4 to 12 percent slopes

### Composition

Rexburg soil, hardpan substratum, and similar inclusions-45 percent
Rexburg soil and similar inclusions-45 percent
Contrasting inclusions-10 percent

#### Characteristics of the Rexburg Soil, Hardpan Substratum

Position on landscape: Loess-covered foothills
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 12 inches-grayish brown silt loam
12 to 31 inches-brown silt loam
31 to 37 inches-light gray silt loam
37 to 42 inches-pale brown silt loam
42 inches-cemented hardpan
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rexburg Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 5 inches-dark grayish brown silt loam
5 to 14 inches-grayish brown silt loam
14 to 25 inches-light brownish gray silt loam
25 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Rexburg silt loam, bedrock substratum (5 percent); Ririe silt loam (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Depth to the hardpan in some areas, water erosion
Suitable crops: Irrigated potatoes, wheat, barley, alfalfa, and peas; nonirrigated wheat, barley, and alfalfa
General management considerations:
•Crops can be irrigated if water is available.
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, irrigated; Ille, nonirrigated

## 92-Rin silt loam, 1 to 4 percent slopes

### Composition

Rin soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Rin Soil

Position on landscape: Loess-covered foothills and hillsides
Elevation: About 5,700 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 18 inches
Typical profile.
0 to 12 inches-dark brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Marystown and Robana silt loams that are dominantly in drainageways (10 percent); Kucera silt loam on short, south- or west-facing slopes (5 percent); soils that are similar to the Rin soil but are in north- and east-facing bowls and in some of the major drainageways and are moderately well drained (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, a short growing season
Suitable crops: Irrigated potatoes, wheat, barley, pasture, alfalfa, and peas; nonirrigated wheat, alfalfa, pasture, potatoes, and barley
General management considerations:
• Production is limited mainly by the short growing season.
• The best suited irrigation method is a sprinkler system.
•Subsoiling terrace basins improves drainage.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

#### Capability Classification

IVc, irrigated and nonirrigated

## 93-Rin silt loam, 4 to 12 percent slopes

### Composition

Rin soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

#### Characteristics of the Rin Soil

Position on landscape: Hillsides, loess-covered foothills
Elevation: About 5,700 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 12 inches-dark brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

#### Inclusions

Kucera silt loam (5 percent); soils that are similar to Rin and Kucera soils but are gravelly clay loam at a depth of 10 to 40 inches (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated barley and alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• The best suited irrigation method is a sprinkler system.
• Terraces are likely to be ponded for prolonged periods.
•Subsoiling terrace basins improves drainage.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

#### Capability Classification

IVe, irrigated and nonirrigated

## 94-Rin silt loam, 12 to 20 percent slopes

### Composition

Rin soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Rin Soil

Position on landscape: Loess-covered foothills and hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 65 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Rin soil but have 5 to 20 percent gravel or cobbles throughout (5 percent); Greys silt loam in north- and east-facing bowls

(5 percent); Tetonia and Lantonia silt loams on south- and east-facing slopes (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Alfalfa, barley
General management considerations:
• Production is limited mainly by the short growing season.
• Crops in the northeast-facing bowls are subject to a higher risk of winterkill.
•Establishing new plantings may be difficult.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Seeding a permanent cover of grasses and legumes reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 95-Rin-Kucera silt loams, 4 to 12 percent slopes

### Composition

Rin soil and similar inclusions-60 percent
Kucera soil and similar inclusions-25 percent
Contrasting inclusions-15 percent

### Characteristics of the Rin Soil

Position on landscape: Loess-covered foothills and hillsides
Elevation: About 5,570 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 18 inches
Typical profile. -
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Kucera Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,570 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Rin soil but are dominantly in drainageways and have 5 to 35 percent gravel, cobbles, or stones throughout (15 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Irrigated potatoes, wheat, barley, and alfalfa; nonirrigated alfalfa and barley
General management considerations:
• Production is limited mainly by the short growing season.
• The best suited irrigation method is a sprinkler system.
• Terraces are likely to be ponded for prolonged periods.
•Subsoiling terrace basins improves drainage.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, irrigated and nonirrigated

## 96-Rin-Lantonia silt loams, 1 to 4 percent slopes

### Composition

Rin soil and similar inclusions-50 percent
Lantonia soil and similar inclusions-40 percent
Contrasting inclusions-10 percent

### Characteristics of the Rin Soil

Position on landscape: Plains, north-facing hillsides
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Characteristics of the Lantonia Soil

Position on landscape: Loessal plains, south-facing hillsides, ridgetops
Elevation: About 6,000 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 18 inches-dark brown silt loam
18 to 27 inches-brown silt loam
27 to 51 inches-light yellowish brown silt loam
51 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Tetonia silt loam on south-facing slopes (5 percent); Greys and Robana silt loams on the north- and east-facing sides of draws (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, short growing season
Suitable crops: Barley, alfalfa, potatoes
General management considerations:
• Production is limited mainly by the short growing season.
• Terraces in areas of the Rin soil are likely to be ponded.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

### Capability Classification

IVc, nonirrigated

## 97-Rin-Lantonia silt loams, 4 to 12 percent slopes

### Composition

Rin soil and similar inclusions-45 percent
Lantonia soil and similar inclusions-40 percent
Contrasting inclusions-15 percent

### Characteristics of the Rin Soil

Position on landscape: Plains, north- and east-facing hillsides and draws
Elevation: About 6,050 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Lantonia Soil

Position on landscape: Plains, ridgetops, south- and west-facing hillsides
Elevation: About 6,050 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 27 inches-brown silt loam
27 to 51 inches-light yellowish brown silt loam
51 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Tetonia silt loam on south-facing ridgetops (5 percent);

Marystown silt loam in drainageways (5 percent); Greys and Robana silt loams (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:

- Production is limited mainly by the short growing season.
- Terraces on the bottom of draws and on north-facing slopes are likely to be ponded for prolonged periods.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.

### Capability Classification

lVe, nonirrigated

## 98-Rin-Vadnais loams, 1 to 4 percent slopes

### Composition

Rin soil and similar inclusions-65 percent
Vadnais soil and similar inclusions-15 percent
Contrasting inclusions-20 percent

### Characteristics of the Rin Soil

Position on landscape: North-facing hillsides, draws
Elevation: About 5,620 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 60 inches-light yellowish brown and yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Vadnais Soil

Position on landscape: South-facing hillsides on loess-covered plains
Elevation: About 5,620 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-dark grayish brown loam
12 to 32 inches-silt loam that is brown in the upper part and pale brown in the lower part
32 to 38 inches-pale brown silty clay loam
38 inches-rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Sadorus gravelly loam in convex areas (10 percent); Vadnais soil, clayey substratum, and Hagenbarth loam on flats or in slight depressions (5 percent); Katseanes loam in convex areas (5 percent)

### Use and Management

Major uses: Rangeland, pasture, nonirrigated cropland
Major management factors: Depth to bedrock in some areas, Rock outcrop in some areas, water erosion in some areas, a short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Rin soil-mountain snowberry, Woods rose, slender wheatgrass, bluebunch wheatgrass, Kentucky bluegrass; Vadnais soil-mountain big sagebrush, arrowleaf balsamroot, Idaho fescue, Kentucky bluegrass
General management considerations:

- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

**Nonirrigated cropland**

Suitable crops: Barley, alfalfa, pasture
General management considerations:

- Production is limited mainly by the short growing season.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope maintain tilth and increase the rate of water intake.

### Capability Classification

IVc, nonirrigated

## 99-Riverwash, gravelly

### Composition

Riverwash-90 percent
Contrasting inclusions-10 percent

### Characteristics of the Riverwash

Position on landscape: Escarpments, flood plains, stream terraces, washes
Slope features: Concave to convex, undulating to hilly
Rock fragments on surface: 0 to 40 percent boulders, stones, cobbles, and gravel
Reference profile:
0 to 20 inches or more-sand, loamy sand, or sandy loam that is 0 to 40 percent rock fragments throughout

### Inclusions

Labenzo silt loam; St. Anthony gravelly sandy loam that has slopes of 0 to 2 percent; areas of sand and gravel that have slopes of 2 to 10 percent (5 percent); Rock outcrop (5 percent)

### Capability Classification

VIIIs, nonirrigated

## 100-Robana-Rin silt loams, 1 to 4 percent slopes

### Composition

Robana soil and similar inclusions-60 percent
Rin soil and similar inclusions-30 percent
Contrasting inclusions-10 percent

### Characteristics of the Robana Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,990 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-dark brown silt loam
12 to 19 inches-brown silt loam
19 to 34 inches-yellowish brown silt loam
34 to 54 inches-light yellowish brown silt loam
54 to 80 inches-yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Characteristics of the Rin Soil

Position on landscape: Loess-covered foothills and hillsides
Elevation: About 5,620 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-dark brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Soils that are similar to the Rin and Robana soils but have 15 to 35 percent gravel or cobbles throughout (5 percent); soils that are similar to the Robana soil but have a seasonal high water table (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Wetness in some areas, water erosion, a short growing season
Suitable crops: Alfalfa, barley
General management considerations:
• Production is limited mainly by the short growing season.
• Seeps may form in excavations near existing wet spots.
• Ripping of terrace basins generally is not effective on this unit because of the high content of moisture in the subsoil.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope maintain tilth and increase the rate of water intake.

### Capability Classification

IVc, nonirrigated

## 101-Robana-Rin silt loams, 4 to 12 percent slopes

### Composition

Robana soil and similar inclusions-65 percent
Rin soil and similar inclusions-30 percent

Contrasting inclusions-5 percent

### Characteristics of the Robana Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,990 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-dark brown silt loam
12 to 19 inches-brown silt loam
19 to 34 inches-yellowish brown silt loam
34 to 54 inches-light yellowish brown silt loam
54 to 80 inches-yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rin Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,990 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Rin and Robana soils but have 15 to 35 percent gravel or cobbles throughout (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Alfalfa, barley
General management considerations:

- Production is limited mainly by the short growing season.
- Terraces are likely to be ponded for prolonged periods.
- Ripping of terrace basins is not effective on this unit because of the high content of moisture in the subsoil.
- Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
- Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 102-Robinlee-Marystown silt loams, 1 to 4 percent slopes

### Composition

Robinlee soil and similar inclusions-55 percent
Marystown soil and similar inclusions-25 percent
Contrasting inclusions-20 percent

### Characteristics of the Robinlee Soil

Position on landscape: Plains, loess-covered moraines
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 11 inches-dark brown silt loam
11 to 23 inches-dark yellowish brown silt loam
23 to 41 inches-yellowish brown silty clay loam
41 to 63 inches-light yellowish brown and dark yellowish brown loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Characteristics of the Marystown Soil

Position on landscape: Plains, loess-covered moraines
Elevation: About 5,300 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 21 inches-dark brown silt loam
21 to 31 inches-yellowish brown silt loam
31 to 60 inches-silty clay loam that is yellowish brown in the upper part and light yellowish brown in the lower part
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high

Runoff: Slow
Hazard of water erosion: Moderate

### Inclusions

Rexburg silt loam, hardpan substratum (5 percent); soils that are similar to the Robinlee and Marystown soils but are in areas where 5 to 25 percent of the surface is covered with boulders (5 percent); soils that are similar to the Robinlee and Marystown soils but have less than 18 percent clay (5 percent); stony soils that are shallow to deep over bedrock, are on ridges, and have slopes of 1 to 8 percent (5 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Boulders in some areas, stones in some areas, depth to bedrock in some areas, water erosion
Suitable crops: Irrigated potatoes, barley, wheat, alfalfa, and pasture; nonirrigated barley, alfalfa, and pasture
General management considerations:
•A tillage pan forms easily if this unit is tilled when wet.
• The best suited irrigation method is a sprinkler system.
• Regulating the rate at which irrigation water is applied helps to control runoff and erosion.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 103-Rock outcrop-Sadorus complex, 4 to 50 percent slopes

### Composition

Rock outcrop-45 percent
Sadorus gravelly sandy loam and similar inclusions-35 percent
Contrasting inclusions-20 percent

### Characteristics of the Rock Outcrop

Position on landscape: Canyonsides, hillsides
Kind of material: Escarpments and other exposed areas of rhyolite

### Characteristics of the Sadorus Soil

Position on landscape: Canyonsides, hillsides
Elevation: About 5,500 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 2 inches-dark grayish brown gravelly sandy loam
2 to 14 inches-dark brown gravelly sandy loam
14 inches-fractured rhyolitic tuff
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Rapid or very rapid
Hazard of water erosion: Severe or very severe

### Inclusions

Soils that are similar to the Sadorus soil but have bedrock at a depth of 10 to 40 inches (10 percent); soils that are similar to Booneville gravelly loam but support Douglas fir, are on canyonsides, and have bedrock at a depth of 40 to more than 60 inches (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Rock outcrop, depth to bedrock, slope, available water capacity, a short growing season
Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, mountain big sagebrush, arrowleaf balsamroot
Common invading species: Rocky Mountain maple
General management considerations.
• Production is limited mainly because the areas of soil in this unit are small.
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the areas of Rock outcrop, the depth to bedrock, and the very low available water capacity.

### Capability Classification

VIIs, nonirrigated

## 104-Rock outcrop-Vadnais complex, 1 to 12 percent slopes

### Composition

Rock outcrop-40 percent
Vadnais silt loam and similar inclusions-35 percent
Contrasting inclusions-25 percent

### Characteristics of the Rock Outcrop

Position on landscape: Basalt plains
Kind of material: Exposed pressure ridges and nearly level flows of vesicular basalt

### Characteristics of the Vadnais Soil

Position on landscape: Basalt plains
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 14 inches-dark yellowish brown silt loam
14 to 28 inches-yellowish brown silt loam
28 to 36 inches-yellowish brown cobbly silty clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Katseanes and Hagenbarth silt loams (10 percent); Nayrib very cobbly fine sandy loam and Stipe fine sandy loam (10 percent); soils that are similar to the Vadnais soil but have a layer of lime accumulation above the bedrock (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock, water erosion, a short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, bluebunch wheatgrass, mountain big sagebrush
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the depth to bedrock and the areas of Rock outcrop.
• Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

### Capability Classification

VIIs, nonirrigated

## 105-Rubble land

### Composition

Rubble land-95 percent
Rock outcrop and shallow soils-5 percent

### Characteristics of the Rubble Land

Position on landscape: Canyonsides
Kind of material: Rock fragments from exposed bedrock near canyon rims

### Capability Classification

VIIIs, nonirrigated

## 106-Sadorus-Kucera complex, 1 to 6 percent slopes

### Composition

Sadorus gravelly loam and similar inclusions-50 percent
Kucera silt loam and similar inclusions-30 percent
Contrasting inclusions-20 percent

### Characteristics of the Sadorus Soil

Position on landscape: Ridgetops, shoulder slopes, hillsides
Elevation: About 5,250 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 17 inches-brown gravelly loam
17 inches-hard rhyolitic tuff
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Kucera Soil

Position on landscape: Draws, swales, hillsides
Elevation: About 5,250 feet
Average annual air temperature: About 41 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 17 inches

Typical profile:
0 to 11 inches-dark grayish brown silt loam
11 to 41 inches-brown silt loam
41 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

## Inclusions

Rexburg and Sarilda silt loams (10 percent); soils that are similar to the Sadorus soil but have bedrock at a depth of 20 to 40 inches (5 percent); soils that are similar to the Kucera soil but have 5 to 20 percent gravel and cobbles between depths of 20 and 60 inches (5 percent)

## Use and Management

Major uses: Sadorus soil-rangeland; Kucera soil-irrigated and nonirrigated cropland
Major management factors: Depth to bedrock in some areas, gravel and cobbles in some areas, available water capacity in some areas, water erosion

**Rangeland**

Dominant vegetation in potential natural plant community: Mountain big sagebrush, arrowleaf balsamroot, Idaho fescue, bluebunch wheatgrass
General management considerations:
• Seeding of suitable species to improve the range is limited by the shallowness to bedrock and the very low available water capacity.

**Cropland**

Suitable crops: Irrigated and nonirrigated alfalfa and barley, irrigated potatoes
General management considerations:
• Maintaining crop residue on the surface and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.

Capability Classification

Vle, irrigated and nonirrigated

**107-Sadorus-Vadnais-Katseanes loams, 20 to 50 percent slopes**

## Composition

Sadorus soil and similar inclusions-45 percent
Vadnais soil and similar inclusions-20 percent
Katseanes soil and similar inclusions-15 percent
Contrasting inclusions-20 percent

## Characteristics of the Sadorus Soil

Position on landscape: Hillsides, shoulder slopes, ridges, and draws on a dissected caldera
Elevation: About 5,850 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 8 inches-dark brown loam
8 to 12 inches-brown loam
12 inches-hard rhyolite
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

## Characteristics of the Vadnais Soil

Position on landscape: Hillsides and draws on a dissected caldera
Elevation: About 5,850 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 24 inches-brown and yellowish brown loam and gravelly loam
24 to 34 inches-light reddish brown clay
34 inches-weathered rhyolite
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

## Characteristics of the Katseanes Soil

Position on landscape: Ridgetops, hillsides, shoulder slopes
Elevation: About 5,850 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark grayish brown loam
9 to 18 inches-dark brown and brown silt loam

18 inches-hard rhyolite
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Hagenbarth soil, moist (10 percent); Rock outcrop (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Available water capacity in some areas, depth to bedrock in some areas, water erosion, slope, plant competition in some areas, a short growing season
Dominant vegetation in potential natural plant community: Mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, arrowleaf balsamroot
Common seral species: Snowbrush ceanothus on the Katseanes and Sadorus soils
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the rooting depth, the available water capacity, plant competition, and the slope.

### Capability Classification

VIIe, nonirrigated

## 108-Sarilda-Rock outcrop complex, 1 to 6 percent slopes

### Composition

Sarilda very fine sandy loam and similar inclusions-60 percent
Rock outcrop-15 percent
Contrasting inclusions-25 percent

### Characteristics of the Sarilda Soil

Position on landscape: Loess-covered basalt and rhyolite plains
Elevation: About 5,200 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 30 inches-brown silt loam
30 inches-rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Characteristics of the Rock Outcrop

Position on landscape: Basalt and rhyolite plains Kind of material: Exposed pressure ridges and nearly level flows of basalt and rhyolitic tuff

### Inclusions

Soils that are similar to the Sarilda soil but are more than 40 inches or less than 20 inches deep over bedrock (10 percent); soils that are similar to the Sarilda soil but have 15 to 35 percent gravel or cobbles throughout (10 percent); soils that are similar to the Sarilda soil but have more than 12 percent clay throughout (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland
Major management factor: Wind erosion

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, needleandthread, Idaho fescue, mountain big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species is limited by the hazard of wind erosion and the depth to bedrock.
•The suitability for range seeding is fair.

**Irrigated cropland**

Suitable crops: Alfalfa, pasture
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Adjusting the rate at which irrigation water is applied to the available water capacity and the rate of water intake prevents overirrigation and the leaching of plant nutrients.
• Seeding a permanent cover of grasses and legumes and maintaining crop residue on the surface reduce the risk of wind erosion.

### Capability Classification

IVe, irrigated and nonirrigated

## 109-Sawtelpeak silty clay, 0 to 2 percent slopes

### Composition

Sawtelpeak soil and similar inclusions-75 percent
Contrasting inclusions-25 percent

### Characteristics of the Sawtelpeak Soil

Position on landscape: Dissected lacustrine terraces
Elevation: About 6,450 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 24 inches
Organic mat on surface: 4 inches thick
Typical profile:
0 to 8 inches-very dark grayish brown silty clay
8 to 16 inches-brown silty clay loam
16 to 18 inches-grayish brown silty clay
18 to 26 inches-dark grayish brown silty clay
26 to 43 inches-light brown silty clay
43 to 57 inches-very pale brown very gravelly sandy loam
57 to 60 inches-very pale brown very gravelly coarse sandy loam
Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Available water capacity: Very high
Potential rooting depth: 20 inches for water-tolerant plants; 6 to 24 inches for plants that are not water tolerant
Runoff: Very slow
Hazard of water erosion: Slight
Depth to the seasonal high water table: 6 to 24 inches
Frequency of flooding: Occasional

### Inclusions

Bootjack silty clay loam (10 percent); soils that are similar to the Sawtelpeak soil but have a layer of lime accumulation at a depth of 20 to 40 inches (5 percent); soils that are similar to the Sawtelpeak soil but have less than 35 percent clay between depths of 10 and 40 inches (5 percent); soils that are similar to the Sawtelpeak soil but are somewhat poorly drained or moderately well drained (5 percent)

### Use and Management

Major uses: Rangeland, irrigated pasture
Major management factors: Risk of seepage, wetness, occasional flooding, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Sedge, tufted hairgrass, slender wheatgrass, clover
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the difficulty of eliminating the existing less favorable vegetation.
• Grazing should be delayed until the soil is firm and the preferred forage plants are mature enough to withstand the grazing pressure.

**Irrigated pasture**

General management considerations:
• Production is limited mainly by the very short growing season.
•Wetness limits the choice of plants for seeding.
• Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.
• In favorable years the vegetation can be cut for grass hay.

### Capability Classification

Vw, nonirrigated

## 110-Shotgun loam, 1 to 4 percent slopes

### Composition

Shotgun soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Shotgun Soil

Position on landscape: Basalt plains
Elevation: About 6,500 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 27 inches
Typical profile:
0 to 7 inches-dark brown loam
7 to 30 inches-yellowish brown and light yellowish brown loam
30 inches-unweathered vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Shotgun soil but have 15 to 25 percent stones throughout (10 percent); soils that are similar to the Shotgun soil but are in depressions and are more than 40 inches deep over bedrock (5 percent); Rock outcrop (5 percent)

#### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock, a very short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, mountain brome, slender wheatgrass, arrowleaf balsamroot, mountain big sagebrush
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the very short growing season.
• After seeding, grazing should be deferred until the plants are well established.
• Grazing should be delayed until the soil is adequately drained and is firm enough to withstand trampling by livestock.

### Capability Classification

VIc, nonirrigated

## 111-Siddoway-Jipper-Jipper, loamy substratum complex, 1 to 20 percent slopes

### Composition

Siddoway loamy fine sand and similar inclusions-45 percent
Jipper fine sandy loam and similar inclusions-20 percent
Jipper fine sandy loam, loamy substratum, and similar inclusions-20 percent
Contrasting inclusions-15 percent

#### Characteristics of the Siddoway Soil

Position on landscape: Basalt plains
Elevation: About 5,100 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Slope: 1 to 20 percent
Typical profile:
0 to 19 inches-dark brown loamy fine sand
19 to 28 inches-brown loamy fine sand
28 to 48 inches-pale brown loamy fine sand
48 to 53 inches-white loamy fine sand
53 inches-lime-coated basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Rapid
Available water capacity: Moderate
Potential rooting depth. 40 to 60 inches
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Characteristics of the Jipper Soil

Position on landscape: Basalt plains
Elevation: About 5,100 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Slope: 1 to 6 percent
Typical profile:
0 to 8 inches-grayish brown fine sandy loam
8 to 21 inches-brown very fine sandy loam
21 to 45 inches-light gray very fine sandy loam
45 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Characteristics of the Jipper Soil, Loamy Substratum

Position on landscape: Basalt plains
Elevation: About 5,100 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Slope: 1 to 8 percent
Typical profile:
0 to 22 inches-dark brown fine sandy loam
22 to 31 inches-brown fine sandy loam
31 to 44 inches-yellowish brown gravelly loamy fine sand
44 to 49 inches-light gray gravelly fine sandy loam
49 to 60 inches-white loamy sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Severe

### Inclusions

Juniperbute fine sand (10 percent); Nayrib very cobbly fine sandy loam and similar soils that have less than 35 percent coarse fragments throughout (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, water erosion, risk of seepage
Dominant vegetation in potential natural plant community: Needleandthread, thickspike wheatgrass, bluebunch wheatgrass, Letterman needlegrass, arrowleaf balsamroot, antelope bitterbrush, basin big sagebrush, mountain big sagebrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the hazards of wind erosion and water erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Seepage limits the construction of livestock watering ponds and other water impoundments.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 112-Siddoway, moist-Juniperbute complex, 1 to 10 percent slopes

### Composition

Siddoway loamy fine sand and similar inclusions-60 percent
Juniperbute fine sand and similar inclusions-20 percent
Contrasting inclusions-20 percent
Characteristics of the Siddoway Soil Position on landscape: Hillsides and basins on basalt plains

Elevation: About 5,500 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 19 inches-loamy fine sand that is dark grayish brown in the upper part and brown in the lower part
19 to 29 inches-light gray loamy sand
29 to 40 inches-pale brown fine sand
40 to 60 inches-pale brown loamy fine sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Juniperbute Soil

Position on landscape: Stabilized dunes, hillsides, and basins on basalt plains
Elevation: About 5,500 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Siddoway soil but have bedrock within a depth of 60 inches (10 percent); Nayrib very cobbly fine sandy loam and Rock outcrop (10 percent)

### Use and Management

Major uses: Rangeland, nonirrigated cropland Major management factors: Wind erosion, available water capacity in some areas

**Rangeland**

Dominant vegetation in potential natural plant community: Needleandthread, bluebunch wheatgrass, arrowleaf balsamroot, mountain big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods maybe subject to a greater risk of erosion.

**Nonirrigated cropland**

Suitable crops: Wheat, barley
General management considerations.
• Crop production is low in most years because of the limited precipitation and the restricted available water capacity.

• Maintaining crop residue on the surface, seeding a permanent cover of grasses and legumes, and maintaining the plant cover reduce the risk of wind erosion.

### Capability Classification

IVe, nonirrigated

## 113-Siddoway, moist-Juniperbute complex, 10 to 25 percent slopes

### Composition

Siddoway loamy fine sand and similar inclusions-40 percent
Juniperbute fine sand and similar inclusions-35 percent
Contrasting inclusions-25 percent

### Characteristics of the Siddoway Soil

Position on landscape: Mountainsides, stabilized dunes, and hillsides on basalt plains
Elevation: About 5,500 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 19 inches-loamy fine sand that is dark grayish brown in the upper part and brown in the lower part
19 to 29 inches-light gray loamy sand
29 to 40 inches-pale brown fine sand
40 to 60 inches-pale brown loamy fine sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Rapid
Available water capacity: Moderate
Runoff: Medium
Hazard of water erosion: Moderate
Hazard of wind erosion: Very severe

### Characteristics of the Juniperbute Soil

Position on landscape: Mountainsides and stabilized dunes on basalt plains
Elevation: About 5,500 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 85 days
Average annual precipitation: About 16 inches
Typical profile. -
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Slow
Hazard of water erosion: Slight Hazard of wind erosion: Very severe

### Inclusions

Soils that are similar to the Siddoway soil but have bedrock within a depth of 60 inches (10 percent); Diston loamy sand (10 percent); Nayrib very cobbly fine sandy loam and Rock outcrop (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Low available water capacity, wind erosion, slope, risk of seepage
Dominant vegetation in potential natural plant community: Needleandthread, bluebunch wheatgrass, arrowleaf balsamroot, mountain big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

### Capability Classification

Vle, nonirrigated

## 114-Snowshoe loamy fine sand, 1 to 6 percent slopes

### Composition

Snowshoe soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Snowshoe Soil

Position on landscape: Basalt plains
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 80 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 28 inches-loamy fine sand that is brown in the upper part and pale brown in the lower part
28 to 40 inches-pale brown fine sandy loam
40 to 60 inches-light yellowish brown loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Wolverine fine sand and Sandcreek sand (5 percent); soils that are similar to the Snowshoe soil but have bedrock or a layer of lime accumulation at a depth of 20 to 60 inches (10 percent); soils that are similar to the Snowshoe soil but have slopes of more than 6 percent (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, risk of seepage
Dominant vegetation in potential natural plant community: Needleandthread, thickspike wheatgrass, arrowleaf balsamroot, basin big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

Vle, nonirrigated

## 115-Snowshoe-Juniperbute complex, 1 to 12 percent slopes

### Composition

Snowshoe loamy fine sand and similar inclusions-50 percent
Juniperbute fine sand and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Snowshoe Soil

Position on landscape: Basalt plains
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 28 inches-loamy fine sand that is brown in the upper part and pale brown in the lower part
28 to 40 inches-pale brown fine sandy loam
40 to 60 inches-light yellowish brown loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Characteristics of the Juniperbute Soil

Position on landscape: Stabilized dunes on basalt plains
Elevation: About 5,400 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 60 inches-brown fine sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Soils that are similar to the Snowshoe soil but have bedrock at a depth of 20 to 60 inches (10 percent); Wolverine fine sand, bedrock substratum, and Rock outcrop on south- and west-facing slopes (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Wind erosion, risk of seepage
Dominant vegetation in potential natural plant community: Needleandthread, thickspike wheatgrass, arrowleaf balsamroot, basin big sagebrush, antelope bitterbrush
General management considerations:
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

Vle, nonirrigated

## 116-Splitbutte-Rock outcrop-Povey complex, 20 to 45 percent slopes

### Composition

Splitbutte very stony sandy loam and similar inclusions-40 percent
Rock outcrop-30 percent
Povey very stony loam and similar inclusions-20 percent
Contrasting inclusions-10 percent

### Characteristics of the Splitbutte Soil

Position on landscape: Ridgetops, shoulder slopes, and mountainsides on rhyolite plains
Elevation: About 6,100 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 55 days
Average annual precipitation: About 20 inches
Rock fragments on surface: 3 to 15 percent stones, 15 to 30 percent cobbles and gravel
Typical profile:
0 to 6 inches-very dark grayish brown very stony sandy loam
6 to 12 inches-very dark grayish brown very gravelly loam
12 to 37 inches-yellowish brown extremely stony loam
37 inches-fractured rhyolite
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Rock Outcrop

Position on landscape: Ridgetops, shoulder slopes, mountainsides
Kind of material: Exposed rhyolite

### Characteristics of the Povey Soil

Position on landscape: Draws, mountainsides
Elevation: About 6,000 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 55 days
Average annual precipitation: About 20 inches
Rock fragments on surface: 5 to 15 percent stones, 35 to 50 percent cobbles and gravel
Typical profile:
0 to 4 inches-dark brown very stony loam
4 to 23 inches-dark brown extremely stony loam
23 to 60 inches-brown extremely stony loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Povey soil but have a more clayey layer at a depth of 20 to 45 inches (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Stones, Rock outcrop, slope, short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, bluebunch wheatgrass, Columbia needlegrass, mountain big sagebrush
Common invading species: Ceanothus
General management considerations:
- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Seeding of suitable species to improve the range is limited by the areas of Rock outcrop and the slope.
- Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
- Grazing should be delayed until the soil is adequately drained and is firm enough to withstand trampling by livestock.

### Capability Classification

VIs, nonirrigated

## 117-Spliten fine sandy loam, 1 to 8 percent slopes

### Composition

Spliten soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Spliten Soil

Position on landscape: Basalt plains
Elevation: About 6,250 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 8 inches-dark brown fine sandy loam
8 to 13 inches-brown fine sandy loam
13 to 18 inches-yellowish brown gravelly sandy loam
18 inches-vesicular basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Spliten soil but are more than 20 inches deep over bedrock (10 percent); soils that are similar to Pinebutte silt loam but have bedrock at a depth of 20 to 60 inches (5 percent); Nayrib very cobbly fine sandy loam, Katseanes and Vadnais silt loams, and Rock outcrop (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock, wind erosion, available water capacity, a short growing season
Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, mountain big sagebrush, arrowleaf balsamroot
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the shallowness to bedrock, droughtiness, and the irregular topography.
• Bare areas may be subject to a severe hazard of wind erosion.

### Capability Classification

VIe, nonirrigated

## 118-Spliten-Shotgun-Rock outcrop complex, 1 to 12 percent slopes

### Composition

Spliten loam and similar inclusions-30 percent
Shotgun loam and similar inclusions-30 percent
Rock outcrop-20 percent
Contrasting inclusions-20 percent

### Characteristics of the Spliten Soil

Position on landscape: Basalt plains
Elevation: About 6,350 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 27 inches
Typical profile.
0 to 17 inches-brown loam
17 inches-unweathered basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Shotgun Soil

Position on landscape: Basalt plains
Elevation: About 6,350 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 27 inches
Typical profile:
0 to 7 inches-dark brown loam
7 to 30 inches-yellowish brown and light yellowish brown loam
30 inches-unweathered vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Rock Outcrop

Position on landscape: Basalt plains
Kind of material: Knobs and ridges of exposed vesicular basalt

### Inclusions

Soils that are similar to the Shotgun soil but have bedrock at a depth of 40 to 60 inches (15 percent); soils that are similar to the Spliten and Shotgun soils but have more than 35 percent gravel and cobbles throughout (5 percent)

### Use and Management

Major uses: Rangeland, summer homesites
Major management factors: Depth to bedrock, water erosion, available water capacity in some areas, Rock outcrop, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community. Idaho fescue, bluebunch wheatgrass, mountain brome, mountain big sagebrush
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the depth to bedrock.
• Seeding the better suited areas is difficult because of

the pattern in which they occur with the more poorly suited areas.

**Building site development**

General management considerations:
• Excavation is hampered by the limited depth to bedrock.
• Septic tank absorption fields can be expected to function poorly because of the limited depth to bedrock.

### Capability Classification

Vle, nonirrigated

## 119-Stamp sandy loam, 0 to 4 percent slopes

### Composition

Stamp soil and similar inclusions-75 percent
Contrasting inclusions-25 percent

### Characteristics of the Stamp Soil

Position on landscape: Outwash plains, stream terraces
Elevation: About 6,300 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 29 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 2 inches-light brownish gray sandy loam
2 to 7 inches-grayish brown sandy loam
7 to 19 inches-brown sandy loam
19 to 30 inches-pale brown sandy loam
30 to 50 inches-very pale brown gravelly coarse sandy loam
50 to 60 inches-pale brown gravelly coarse sandy loam
Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Available water capacity: Moderate to a depth of 30 inches; very rapid below
Potential rooting depth: More than 60 inches for water-tolerant plants; 6 to 35 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Depth to the water table: 6 to 36 inches from January through June; 36 to 60 inches during the rest of the year
Frequency of flooding: Rare

### Inclusions

Soils that are similar to the Stamp soil but are poorly drained (15 percent); soils that are similar to the Stamp soil but are moderately well drained or well drained (10 percent)

### Use and Management

Major uses: Woodland, grazable woodland, summer homesites
Major management factors: Wetness, risk of seepage, inadequate drainage outlets in some areas, flooding, a very short growing season, risk of windthrow

**Woodland**

Common forest overstory plants: Lodgepole pine
Mean site index for lodgepole pine: 60
Estimated average annual production per acre of lodgepole pine: About 50 cubic feet from a stand of trees 100 years old
General management considerations:
• The seasonal high water table restricts the use of equipment to periods in midsummer or midwinter when the soil is dry or frozen.
• Windthrow is a hazard when the soil is saturated and winds are strong.

**Grazable understory**

Common forest understory plants: Slender wheatgrass, Kentucky bluegrass, sedge, mountain brome, common yarrow, lupine
Potential annual production of air-dry vegetation: About 1,700 pounds per acre under an open canopy; about 1,000 pounds per acre under a closed canopy
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Grazing is restricted by the dense overstory and the risk of windthrow.

**Building site development**

General management considerations:
• Septic tank absorption fields can be expected to function poorly because of the wetness.
• The risk of seepage and the hazard of water pollution limit the use of some areas of this unit as sites for septic tank absorption fields.

### Capability Classification

Vlc, nonirrigated

## 120-Stamp loam, ponded, 0 to 4 percent slopes

### Composition

Stamp soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Stamp Soil

Position on landscape: Outwash plains, stream terraces
Elevation: About 6,400 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 29 inches
Typical profile:
0 to 11 inches-light brownish gray loam
11 to 20 inches-grayish brown loam
20 to 38 inches-light brownish gray and light gray coarse sandy loam
38 to 60 inches-variegated gravelly coarse sand
Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate to a depth of 38 inches; very rapid below
Available water capacity: Moderate
Potential rooting depth: 60 inches for water-tolerant plants; 0 to 18 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Seasonal high water table: 12 inches above to 18 inches below the surface
Frequency of flooding: Rare

### Inclusions

Soils that are similar to the Stamp soil but are on slightly elevated terraces and are well drained or moderately well drained (10 percent); soils that are similar to the Stamp soil but are in depressions near Toms Creek and the Buffalo River, are poorly drained, and have a layer of diatomaceous earth near the surface (5 percent)

### Use and Management

Major uses: Rangeland, summer homesites
Major management factors: Wetness, flooding, a very short growing season

#### Rangeland

Dominant vegetation in potential natural plant community: Slender wheatgrass, tufted hairgrass, sedges
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the difficulty of eliminating the existing less desirable vegetation and by the wetness.
• Grazing should be delayed until the soil is firm and the preferred forage plants are mature enough to withstand the grazing pressure.

#### Building site development

General management considerations:
• Cutbanks are not stable and can cave in.
• The risk of seepage and the hazard of water pollution limit this unit as a site for septic tank absorption fields.
• Onsite sewage disposal systems require protection from flooding.

### Capability Classification

Vw, nonirrigated

## 121-St. Anthony gravelly sandy loam, 0 to 4 percent slopes

### Composition

St. Anthony soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the St. Anthony Soil

Position on landscape: Stream terraces
Elevation: About 5,000 feet
Average annual air temperature: About 43 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 14 inches
Typical profile:
0 to 7 inches-dark brown gravelly sandy loam
7 to 12 inches-brown gravelly sandy loam
12 to 21 inches-brown very gravelly sandy clay loam
21 to 60 inches-dark gray gravel and coarse sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid to a depth of 21 inches; very rapid below
Available water capacity: Low
Runoff: Very slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the St. Anthony soil but have less than 15 percent coarse fragments within a depth of 21 inches (5 percent); Allwit gravelly sandy loam and Fluvaquents (5 percent); soils that are similar to the St. Anthony soil but have bedrock within a depth of 60 inches (5 percent); soils that are similar to the St. Anthony soil but have a water table within a depth of 40 inches because of

**Figure 5.-Irrigated pasture in an area of St. Anthony gravelly sandy loam, 0 to 4 percent slopes. This area was flooded by the Teton River in 1976.**

subirrigation during the growing season (5 percent)

## Use and Management

Major uses: Irrigated cropland, pasture, windbreaks
Major management factors: Gravel and cobbles, permeability, variability in the thickness of the surface layer in some areas as a result of the flooding of the Teton River in 1976

**Irrigated cropland**

Suitable crops: Barley, wheat, alfalfa, potatoes, pasture (fig. 5)

General management considerations:

- Irrigation is needed in areas used for crops.
- Suitable irrigation methods are sprinkler and subirrigation systems.
- Because of gravel and cobbles on the surface, seedbed preparation and harvesting of potatoes are difficult in some areas.
- Maintaining crop residue on or near the surface reduces the risk of erosion.

**Windbreaks**

Trees suitable for planting: Idahybrid poplar, Russian

olive, golden willow, Rocky Mountain juniper, Austrian pine, Norway spruce, Scotch pine
Shrubs suitable for planting: Lilac, Siberian peashrub, European privet, Tatarian honeysuckle, Peking cotoneaster

### Capability Classification

IIIe, irrigated; VIs, nonirrigated

## 122-Stipe-Jipper fine sandy loams, 1 to 6 percent slopes

### Composition

Stipe soil and similar inclusions-40 percent
Jipper soil and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Stipe Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 12 inches-brown fine sandy loam
12 to 36 inches-fine sandy loam that is brown in the upper part and light gray in the lower part
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Characteristics of the Jipper Soil

Position on landscape: Basalt plains
Elevation: About 5,300 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-grayish brown fine sandy loam
8 to 45 inches-very fine sandy loam that is brown in the upper part and light gray in the lower part
45 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: High
Potential rooting depth: 40 to 60 inches
Runoff: Slow
Hazard of water erosion: Slight
Hazard of wind erosion: Severe

### Inclusions

Soils that are similar to the Stipe and Jipper soils but do not have a layer of lime accumulation (5 percent); soils that are similar to the Stipe and Jipper soils but have 5 to 30 percent rock fragments throughout (5 percent); Nayrib very cobbly fine sandy loam on ridges and terraces (5 percent); soils that are similar to the Stipe and Jipper soils but have an induced water table and areas of river gravel (5 percent)

#### Use and Management

Major uses: Rangeland, irrigated cropland
Major management factors: Depth to bedrock, wind erosion, permeability

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, Letterman needlegrass, mountain big sagebrush, antelope bitterbrush
General management considerations:
- The suitability for range seeding is good.
- Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
- The suitability of this unit as a site for livestock watering ponds is poor.
- Seepage limits the construction of livestock watering ponds and other water impoundments.

**Irrigated cropland**

Suitable crops: Wheat, barley, potatoes, alfalfa hay
General management considerations:
- The best suited irrigation method is a sprinkler system.
- Keeping tillage to a minimum, using stubble mulch tillage, maintaining a plant cover, and keeping the soil rough and cloddy reduce the risk of wind erosion.

### Capability Classification

IIIe, irrigated; IVe, nonirrigated

## 123-Stringam-Judkins complex, 1 to 6 percent slopes

### Composition

Stringam loam and similar inclusions-45 percent
Judkins gravelly loam and similar inclusions-35 percent
Contrasting inclusions-20 percent

## Characteristics of the Stringam Soil

Position on landscape: Basalt plains
Elevation: About 6,550 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 25 inches
Organic mat on surface: 0.5 inch thick
Typical profile:
0 to 4 inches-brown loam
4 to 9 inches-pale brown loam
9 to 39 inches-loam that is pale brown in the upper part and light yellowish brown in the lower part
39 to 65 inches-light yellowish brown sandy clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Medium
Hazard of water erosion: Moderate

## Characteristics of the Judkins Soil

Position on landscape: Basalt foot slopes and plains
Elevation: About 6,550 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 25 inches
Organic mat on surface: 6 inches thick
Typical profile:
0 to 1 inch-grayish brown loam
1 to 5 inches-light gray gravelly loam 5 to 8 inches-pale brown gravelly loam
8 to 36 inches-light brownish gray extremely stony clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 20 to 40 inches or more
Runoff: Medium
Hazard of water erosion: Moderate

## Inclusions

Soils that are similar to the Judkins soil but are in areas where 0.1 to 5.0 percent of the surface is covered with stones (5 percent); soils that are similar to the Stringam and Judkins soils but have bedrock at a depth of 40 to 60 inches (10 percent); Rock outcrop (5 percent)

## Use and Management

Major uses: Grazable understory, woodland
Major management factors: Slow permeability, plant competition, Rock outcrop in some areas, a very short growing season

**Woodland (Stringam soil)**

Dominant vegetation in potential natural plant community: Pine reedgrass, blue wildrye, mountain snowberry, low Oregongrape, Douglas fir, lodgepole pine
Mean site index for stated species: Douglas fir-50; lodgepole pine-70
Estimated average annual production per acre: Douglas fir-about 38 cubic feet from a stand of trees 60 years old; lodgepole pine-about 59 cubic feet from a stand of trees 100 years old

**Woodland (Judkins soil)**

Dominant vegetation in potential natural plant community: Pine reedgrass, mountain brome, blue wildrye, slender wheatgrass, bluegrass, lupine, Douglas fir, lodgepole pine
Mean site index for stated species: Douglas fir-60; lodgepole pine-65
Estimated average annual production per acre: Douglas fir-about 46 cubic feet from a stand of trees 60 years old; lodgepole pine-about 54 cubic feet from a stand of trees 100 years old

**Woodland management (Stringam and Judkins soils)**

General management considerations:
• Excessively disturbing the surface when timber is harvested or logging roads are built increases the hazard of erosion and leaves a greater number of rock fragments on the surface.
• Trees commonly are subject to windthrow when the soils are excessively wet and winds are strong.

**Grazable understory**

Common forest understory plants: Pine reedgrass, blue wildrye, slender wheatgrass, mountain snowberry
Average annual production of air-dry vegetation: Stringam soil-about 700 pounds per acre under an open canopy and 300 pounds per acre under a closed canopy; Judkins soil-about 1,200 pounds per acre under an open canopy and 400 pounds per acre under a closed canopy
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• If open areas are established, a good stand of forage plants can be produced.

## Capability Classification

VIe, nonirrigated

## 124-Sudpeak-Stringam, gravelly subsoil complex, 0 to 3 percent slopes

### Composition

Sudpeak gravelly clay and similar inclusions-40 percent
Stringam silty clay loam and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Sudpeak Soil

Position on landscape: Draws on alluvial fans
Elevation: About 6,600 feet
Average annual air temperature: About 38 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 25 inches
Slope: 0 to 2 percent
Typical profile:
0 to 15 inches-dark grayish brown gravelly clay
15 to 41 inches-light yellowish brown gravelly clay
41 to 60 inches-mottled, brown and yellowish red clay
Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: Very high
Potential rooting depth: 72 inches or more for watertolerant plants; 42 to 72 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Depth to the water table: 42 to 72 inches from April through August; more than 72 inches during the rest of the year
Frequency of flooding: Frequent

### Characteristics of the Stringam Soil

Position on landscape: Alluvial fans on basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 37 degrees F
Frost-free period. About 45 days
Average annual precipitation: About 25 inches
Slope: 1 to 3 percent
Typical profile:
0 to 4 inches-grayish brown silty clay loam
4 to 18 inches-light yellowish brown gravelly clay loam
18 to 60 inches-light yellowish brown very gravelly clay loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Sudpeak soil but have more than 35 percent gravel between depths of 20 and 40 inches (10 percent); soils that are similar to the Sudpeak soil but have less than 35 percent clay between depths of 20 and 40 inches (5 percent); soils that are similar to the Sudpeak soil but are poorly drained (5 percent)

### Use and Management

Major uses: Rangeland, pasture, homesites
Major management factors: Wetness in some areas, flooding in some areas, low strength, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Idaho fescue, mountain brome, slender wheatgrass, sedge, shrubby cinquefoil
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the wetness and the flooding in some areas.
• Grazing should be delayed until the soil is adequately drained and is firm enough to withstand trampling by livestock.

**Pasture**

General management considerations:
• Production is limited mainly by the very short growing season.
• The wetness limits the period of cutting or grazing.

**Building site development**

General management considerations:
• Septic tank absorption fields can be expected to function poorly because of the seasonal wetness and the restricted permeability.
• The quality of roadbeds and road surfaces can be adversely affected by the low soil strength.

### Capability Classification

Vw, nonirrigated

## 125-Targhee loam, 1 to 15 percent slopes

### Composition

Targhee loam and similar inclusions-90 percent
Contrasting inclusion-10 percent

### Characteristics of the Targhee Soil

Position on landscape: Mountainsides
Elevation: About 6,400 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 30 inches
Typical profile:
0 to 5 inches-pale brown loam
5 to 14 inches-light gray gravelly sandy loam
14 to 30 inches-white very gravelly sandy loam
30 to 36 inches-white extremely cobbly sand
36 inches-rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusion

Judkins gravelly loam (10 percent)

### Use and Management

Major uses: Woodland, grazable understory, homesites
Major management factors: Depth to bedrock, permeability, risk of seepage, a very short growing season

**Woodland**

Common forest overstory plants: Douglas fir, lodgepole pine
Mean site index for stated species: Douglas fir-50; lodgepole pine-77
Estimated average annual production per acre: Douglas fir-about 38 cubic feet from a stand of trees 60 years old; lodgepole pine-about 66 cubic feet from a stand of trees 100 years old

**Grazable understory**

Common forest understory plants: Pine reedgrass, bluebunch wheatgrass, Idaho fescue, bluegrass, sticky geranium, lupine, serviceberry, mountain snowberry
Potential annual production of air-dry vegetation: About 1,400 pounds per acre under an open canopy and 600 pounds per acre under a closed canopy
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Windfall is a hazard in some areas.

**Building site development**

General management considerations:
•Cutbanks are not stable and can cave in.
• The risk of seepage and the hazard of water pollution limit this unit as a site for septic tank absorption fields.
• The deep cuts needed to level the surface for roads can expose soft bedrock, but the bedrock can be easily excavated.

### Capability Classification

Vle, nonirrigated

## 126-Targhee loam, 15 to 40 percent slopes

### Composition

Targhee loam and similar inclusions-90 percent
Contrasting inclusion-10 percent

### Characteristics of the Targhee Soil

Position on landscape: Mountainsides
Elevation: About 6,400 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 30 inches
Typical profile:
0 to 5 inches-pale brown loam
5 to 14 inches-light gray gravelly sandy loam
14 to 30 inches-white very gravelly sandy loam
30 to 36 inches-white extremely cobbly sand
36 inches-rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Low
Potential rooting depth: 20 to 40 inches
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusion

Judkins gravelly loam (10 percent)

### Use and Management

Major uses: Woodland, grazable understory, homesites
Major management factors: Instability of the cutbanks, depth to bedrock, permeability, slope, water erosion, risk of seepage, a very short growing season

**Woodland**

Common forest overstory plants: Douglas fir, lodgepole pine
Mean site index for stated species: Douglas fir-50; lodgepole pine-77

Estimated average annual production per acre: Douglas fir-about 38 cubic feet from a stand of trees 60 years old; lodgepole pine-about 66 cubic feet from a stand of trees 100 years old

General management considerations:

• The slope limits the kinds of equipment that can be used in forest management.

• Adequately designed road drainage systems reduce the risk of erosion.

**Grazable understory**

Common forest understory plants: Pine reedgrass, bluebunch wheatgrass, Idaho fescue, bluegrass, sticky geranium, lupine, serviceberry, mountain snowberry

Potential annual production of air-dry vegetation: About 1,400 pounds per acre under an open canopy and 600 pounds per acre under a closed canopy

General management considerations:

• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

• Windfall is a hazard in some areas.

**Building site development**

General management considerations:

•Cutbanks are not stable and can cave in.

• The risk of seepage and the hazard of water pollution limit this unit as a site for septic tank absorption fields.

• Septic tank absorption fields can be expected to function poorly because of the slope and the moderately rapid permeability.

• Specially designed roads help to control runoff and stabilize cuts.

### Capability Classification

VIe, nonirrigated

## 127-Targhee-Judkins complex, 15 to 30 percent slopes

### Composition

Targhee loam and similar inclusions-45 percent

Judkins gravelly loam and similar inclusions-35 percent

Contrasting inclusions-20 percent

### Characteristics of the Targhee Soil

Position on landscape: South-facing mountainsides

Elevation: About 6,600 feet

Average annual air temperature: About 37 degrees F

Frost-free period: About 45 days

Average annual precipitation: About 30 inches

Typical profile:

0 to 5 inches-pale brown loam

5 to 14 inches-light gray gravelly sandy loam

14 to 30 inches-white very gravelly sandy loam

30 to 36 inches-white extremely cobbly sand

36 inches-rhyolitic tuff

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low

Potential rooting depth: 20 to 40 inches

Runoff: Very rapid

Hazard of water erosion: Very severe

### Characteristics of the Judkins Soil

Position on landscape: North-facing mountainsides

Elevation: About 6,600 feet

Average annual air temperature: About 37 degrees F

Frost-free period: About 45 days

Average annual precipitation: About 27 inches

Organic mat on surface: 6 inches thick

Typical profile:

0 to 1 inch-grayish brown loam

1 to 5 inches-light gray gravelly loam

5 to 8 inches-pale brown gravelly loam

8 to 36 inches-light brownish gray extremely stony clay loam

36 inches-fractured rhyolitic tuff

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low

Potential rooting depth: 20 to 40 inches

Runoff: Very rapid

Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Judkins soil but are less than 20 inches deep over bedrock and have more than 60 percent coarse fragments throughout (10 percent); soils that are similar to the Judkins soil but have more than 35 percent clay between depths of 15 and 26 inches (5 percent); soils that are similar to the Targhee and Judkins soils but have bedrock at a depth of 40 inches or more (5 percent)

### Use and Management

Major uses: Woodland, grazable understory

Major management factors: Water erosion, slope, a very short growing season

**Woodland**

Common forest overstory plants: Douglas fir, lodgepole pine

Mean site index for Douglas fir: Targhee soil-50; Judkins soil-60
Estimated average annual production per acre of Douglas fir: Targhee soil-about 38 cubic feet from a stand of trees 60 years old; Judkins soil-about 46 cubic feet from a stand of trees 60 years old
Mean site index for lodgepole pine: Targhee soil-77; Judkins soil-65
Estimated average annual production per acre of lodgepole pine: Targhee soil-about 66 cubic feet from a stand of trees 100 years old; Judkins soil about 54 cubic feet from a stand of trees 100 years old
General management considerations:
• The slope limits the kinds of equipment that can be used in forest management.
• Adequately designed road drainage systems reduce the risk of erosion.
• The seedling mortality rate is higher on south- and west-facing slopes than on north- and east-facing slopes.

**Grazable understory**

Common forest understory plants: Pine reedgrass, bluebunch wheatgrass, sticky geranium, serviceberry, mountain snowberry
Potential annual production of air-dry vegetation: About 1,500 pounds per acre under an open canopy; about 700 pounds per acre under a closed canopy
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.

### Capability Classification

VIe, nonirrigated

## 128-Tepete-Bootjack complex, 0 to 1 percent slopes

### Composition

Tepete peat and similar inclusions-60 percent
Bootjack silty clay loam-25 percent
Contrasting inclusions-15 percent

### Characteristics of the Tepete Soil

Position on landscape: Low-lying basins on the lower part of alluvial fans
Elevation: About 6,650 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 20 inches
Typical profile:
0 to 34 inches-black and very dark brown peat
34 to 60 inches-light gray silty clay loam
Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately rapid through the peat; moderately slow below
Available water capacity: Very high
Potential rooting depth: 60 inches for water-tolerant plants; 6 inches for plants that are not water tolerant
Runoff: Very slow
Hazard of water erosion: Slight
Seasonal high water table: 12 inches above to 6 inches below the surface

### Characteristics of the Bootjack Soil

Position on landscape: Stream terraces, flood plains
Elevation: About 6,650 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 45 days
Average annual precipitation: About 20 inches
Organic mat on surface: 2 inches thick Typical profile:
0 to 4 inches-grayish brown silty clay loam
4 to 23 inches-light gray and very pale brown silt loam and loam
23 to 60 inches-light gray extremely gravelly loamy coarse sand
Depth class: Very deep Drainage class: Poorly drained
Permeability: Moderately slow
Available water capacity: High
Potential rooting depth: 60 inches for water-tolerant plants; 0 to 18 inches for plants that are not water tolerant
Runoff: Slow
Hazard of water erosion: Slight
Depth to the water table: 0 to 18 inches in spring and early in summer; more than 18 inches during the rest of the year
Frequency of flooding: Frequent

### Inclusions

Soils that are similar to the Tepete soil but have less than 10 inches of peat over gleyed clay or silty clay loam that contains gravel in some areas (15 percent)

### Use and Management

Major uses: Nonirrigated pasture, rangeland
Major management factors: Wetness, flooding, excess humus, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community:
Tufted hairgrass, sedge, shrubby cinquefoil, Kentucky bluegrass, mountain brome, clover
General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the wetness and the difficulty of eliminating the existing less desirable vegetation.

**Nonirrigated pasture**

General management considerations:
• The very short growing season and the wetness limit production.

### Capability Classification

Vw, nonirrigated

## 129-Tetonia-Lantonia silt loams, 1 to 4 percent slopes

### Composition

Tetonia soil and similar inclusions-50 percent
Lantonia soil and similar inclusions-45 percent
Contrasting inclusion-5 percent

### Characteristics of the Tetonia Soil

Position on landscape: Loess-covered foothills and hillsides
Elevation: About 5,950 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam
47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Characteristics of the Lantonia Soil

Position on landscape: Loess-covered foothills and hillsides
Elevation: About 5,950 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 18 inches-dark brown silt loam
18 to 27 inches-brown silt loam
27 to 51 inches-light yellowish brown silt loam
51 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Inclusion

Rin silt loam in draws (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, a short growing season
Suitable crops: Barley, alfalfa, potatoes
General management considerations.
- Production is limited mainly by the short growing season.

### Capability Classification

lVc, nonirrigated

## 130-Tetonia-Lantonia silt loams, 4 to 12 percent slopes

### Composition

Tetonia soil and similar inclusions-40 percent
Lantonia soil and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Tetonia Soil

Position on landscape: Loess-covered hillsides and foothills
Elevation: About 5,950 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 19 inches-grayish brown and brown silt loam
19 to 27 inches-pale brown silt loam
27 to 42 inches-light gray silt loam
42 to 60 inches-silt loam that is light gray in the upper part and very pale brown in the lower part
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion. Severe

### Characteristics of the Lantonia Soil

Position on landscape: Loess-covered hillsides and foothills
Elevation: About 5,950 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 18 inches-dark brown silt loam
18 to 27 inches-brown silt loam
27 to 51 inches-light yellowish brown silt loam
51 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Lantonia and Tetonia soils but are in drainageways and have 5 to 15 percent gravel and cobbles throughout (10 percent); Rin silt loam in drainageways (10 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 131-Tetonia-Lantonia silt loams, 12 to 20 percent slopes

### Composition

Tetonia soil and similar inclusions-45 percent
Lantonia soil and similar inclusions-40 percent
Contrasting inclusions-15 percent

### Characteristics of the Tetonia Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,950 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 16 inches
Typical profile:
0 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam
47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Lantonia Soil

Position on landscape: Loess-covered plains and hillsides
Elevation: About 5,950 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 18 inches-dark brown silt loam
18 to 27 inches-brown silt loam
27 to 51 inches-light yellowish brown silt loam
51 to 60 inches-very pale brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Lantonia and Tetonia soils but have 5 to 15 percent gravel or cobbles throughout (10 percent); Rin silt loam (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• The areas of this unit that have southwestern exposures tend to be drier than the adjacent areas.
• Establishing new plantings is difficult.

• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Seeding a permanent cover of grasses and legumes reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 132-Tetonia-Rin silt loams, 4 to 12 percent slopes

### Composition

Tetonia soil and similar inclusions-40 percent
Rin soil and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Tetonia Soil

Position on landscape: South- and west-facing, loess-covered foothills
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam
47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rin Soil

Position on landscape: North- and east-facing, loess-covered foothills
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Ririe silt loam on south-facing ridges (5 percent); Greys silt loam on north- and east-facing, concave side slopes (5 percent); soils that are similar to the Rin soil but are in drainageways and have 5 to 15 percent gravel and cobbles throughout (5 percent); soils that are similar to the Tetonia and Rin soils but have slopes of less than 4 percent (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, droughtiness on southern exposures, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• The areas of this unit on southern exposures tend to be drier than the adjacent areas.
• Establishing new plantings is difficult on the southern exposures.
• Terraces on the bottom of draws are likely to be ponded for prolonged periods.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

### Capability Classification

lVe, nonirrigated

## 133-Tetonia-Rin silt loams, 12 to 20 percent slopes

### Composition

Tetonia soil and similar inclusions-40 percent
Rin soil and similar inclusions-40 percent
Contrasting inclusions-20 percent

### Characteristics of the Tetonia Soil

Position on landscape: South- and west-facing, loess covered foothills
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam

47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Rin Soil

Position on landscape: North- and east-facing, loess-covered hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 12 inches-brown silt loam
12 to 36 inches-yellowish brown silt loam
36 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Ririe silt loam on south-facing ridges (5 percent); Greys silt loam in north- and east-facing bowls (5 percent); soils that are similar to the Tetonia and Rin soils but are in drainageways and have 5 to 15 percent gravel and cobbles throughout (5 percent); Lantonia silt loam (5 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, available water in some areas, a short growing season
Suitable crops: Barley, alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• The areas of this unit on southwestern exposures tend to be drier than the adjacent areas.
• Crops in the north-facing bowls are subject to a higher risk of winterkill.
• Establishing new plantings is difficult.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Seeding a permanent cover of grasses and legumes reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 134-Tetonia-Ririe silt loams, 1 to 4 percent slopes

### Composition

Tetonia soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Tetonia Soil

Position on landscape: North- and east-facing hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam
47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Moderate

### Characteristics of the Ririe Soil

Position on landscape: South- and west-facing hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile.
0 to 8 inches-dark grayish brown silt loam
8 to 11 inches-yellowish brown silt loam
11 to 20 inches-very pale brown silt loam
20 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Tetonia soil but have bedrock at a depth of 40 to 60 inches (5 percent);

soils that are similar to the Tetonia soil but are on ridges and have 5 to 20 percent gravel or cobbles throughout (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland
Major management factors: Water erosion, a short growing season
Suitable crops: Irrigated potatoes, wheat, and barley; nonirrigated wheat, barley, and alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• The amount of annual precipitation is sufficient for cropping year after year.
• The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, planting on the contour or across the slope, and subsoiling potato fields maintain tilth and increase the rate of water intake.

### Capability Classification

IIIe, irrigated; IIIc, nonirrigated

## 135-Tetonia-Ririe silt loams, 4 to 12 percent slopes

### Composition

Tetonia soil and similar inclusions-50 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-15 percent

### Characteristics of the Tetonia Soil

Position on landscape: North- and east-facing hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam
47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Ririe Soil

Position on landscape: South- and west-facing hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 15 inches
Typical profile:
0 to 8 inches-dark grayish brown silt loam
8 to 11 inches-yellowish brown silt loam
11 to 20 inches-very pale brown silt loam
20 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Tetonia soil but have bedrock at a depth of 40 to 60 inches (5 percent); soils that are similar to the Tetonia soil but are on ridges and have 5 to 20 percent gravel or cobbles throughout (10 percent)

### Use and Management

Major use: Irrigated and nonirrigated cropland Major management factors: Water erosion, slope, a short growing season
Suitable crops: Irrigated and nonirrigated wheat, barley, and alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• The amount of annual precipitation is sufficient for cropping year after year.
• Some fields are irrigated by sprinklers during dry years.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Terraces, diversions, and grassed waterways reduce the risk of erosion.

#### Capability Classification

IVe, irrigated; IIIe, nonirrigated

## 136-Tetonia-Ririe silt loams, 12 to 20 percent slopes

### Composition

Tetonia soil and similar inclusions-40 percent
Ririe soil and similar inclusions-35 percent
Contrasting inclusions-25 percent

### Characteristics of the Tetonia Soil

Position on landscape: North- and east-facing hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 17 inches-dark brown silt loam
17 to 32 inches-brown silt loam
32 to 47 inches-light brownish gray silt loam
47 to 60 inches-light gray silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Characteristics of the Ririe Soil

Position on landscape: South- and west-facing hillsides
Elevation: About 5,800 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 75 days
Average annual precipitation: About 17 inches
Typical profile:
0 to 8 inches-dark grayish brown silt loam
8 to 11 inches-yellowish brown silt loam 11
to 20 inches-very pale brown silt loam
20 to 60 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Tetonia soil but have bedrock at a depth of 40 to 60 inches (5 percent); soils that are similar to the Tetonia soil but have 5 to 20 percent gravel or cobbles throughout (10 percent); Lantonia and Rin silt loams on northfacing hillsides (10 percent)

### Use and Management

Major use: Nonirrigated cropland
Major management factors: Water erosion, slope, a short growing season
Suitable crops: Wheat, barley, alfalfa
General management considerations:
• Production is limited mainly by the short growing season.
• Maintaining crop residue on the surface, chiseling or subsoiling stubble fields on the contour or across the slope in the fall, and planting on the contour or across the slope reduce the risk of erosion, maintain tilth, and increase the rate of water intake.
• Seeding a permanent cover of grasses and legumes reduces the risk of erosion.

### Capability Classification

IVe, nonirrigated

## 137-Trude gravelly loam, 0 to 4 percent slopes

### Composition

Trude soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Trude Soil

Position on landscape: Terraces, outwash plains
Elevation: About 6,300 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 40 days
Average annual precipitation: About 29 inches
Typical profile:
0 to 12 inches-yellowish brown gravelly loam
12 to 17 inches-yellowish brown very gravelly coarse sandy loam
17 to 25 inches-yellowish brown very gravelly loamy coarse sand
25 to 60 inches-variegated very gravelly coarse sand
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid to a depth of 25 inches; very rapid below
Available water capacity: Moderate
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Soils that are similar to the Trude soil but are in depressions, support lodgepole pine, and are somewhat poorly drained (10 percent); Bootjack silty clay loam in depressions (5 percent)

### Use and Management

Major uses: Rangeland, summer homesites
Major management factors: Instability of cutbanks, gravel, permeability, risk of seepage, a very short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, mountain big sagebrush, Columbia needlegrass

General management considerations:
• A very cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the available water capacity and the gravel on the surface.
• Seepage limits the construction of livestock watering ponds and other water impoundments.

**Building site development**

General management considerations:
• Cutbanks are not stable and can cave in.
• The risk of seepage and the hazard of water pollution limit this unit as a site for septic tank absorption fields.

### Capability Classification

VIs, nonirrigated

## 138-Turnerville silt loam, 1 to 4 percent slopes

### Composition

Turnerville soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Turnerville Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 5 inches-pale brown silt loam
5 to 15 inches-light yellowish brown silt loam
15 to 22 inches-very pale brown and yellowish brown silt loam
22 to 33 inches-brown silt loam
33 to 63 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Slow
Hazard of water erosion: Slight

### Inclusions

Greys and Robana silt loams (10 percent); soils that are similar to the Turnerville soil but have 5 to 15 percent gravel or cobbles throughout (5 percent)

### Use and Management

Major uses: Woodland, grazable understory, homesites
Major management factors: Frost action, low strength, a short growing season

**Woodland**

Common forest overstory plants: Lodgepole pine
Mean site index for lodgepole pine: 79
Estimated average annual production per acre of lodgepole pine: About 68 cubic feet from a stand of trees 100 years old
General management considerations:
• Windthrow is a hazard when the soil is saturated and winds are strong.
• Adequately designed road drainage systems reduce the risk of erosion.

**Grazable understory**

Common forest understory plants: Pine reedgrass, blue wildrye, mountain brome, Kentucky bluegrass, lupine, sticky geranium, Fendler meadowrue, western yarrow, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: About 1,500 pounds per acre under an open canopy; about 500 pounds per acre under a closed canopy
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Grazing of the forage by livestock is limited by windfall in some areas.

**Building site development**

General management considerations:
• Excavation increases the risk of water erosion.
• The quality of roadbeds and road surfaces can be adversely affected by frost action and low strength.
• Septic tank absorption fields can be expected to function poorly because of the limited permeability, which restricts the movement and filtration of the effluent.

### Capability Classification

IVc, nonirrigated

## 139-Turnerville silt loam, 4 to 12 percent slopes

### Composition

Turnerville soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Turnerville Soil

Position on landscape: Loess-covered foothills
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 5 inches-pale brown silt loam
5 to 15 inches-light yellowish brown silt loam
15 to 22 inches-very pale brown and yellowish brown silt loam
22 to 33 inches-brown silt loam
33 to 63 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Greys and Robana silt loams (10 percent); soils that are similar to the Turnerville soil but have 5 to 45 percent gravel or cobbles throughout (10 percent)

### Use and Management

Major uses: Woodland, grazable understory, homesites
Major management factors: Low strength, water erosion, frost action, slope, a short growing season

**Woodland**

Common forest overstory plants: Lodgepole pine
Mean site index for lodgepole pine: 79
Estimated average annual production per acre of lodgepole pine: About 68 cubic feet from a stand of trees 100 years old
General management considerations:
• Windthrow is a hazard when the soil is saturated and winds are strong.
• Adequately designed road drainage systems reduce the risk of erosion.
• Rilling and gullying can occur if the soil is disturbed during such activities as the construction of yarding and skid trails and firebreaks.

**Grazable understory**

Common forest understory plants: Pine reedgrass, blue wildrye, mountain brome, Kentucky bluegrass, lupine, sticky geranium, Fendler meadowrue, western yarrow, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: About 1,500 pounds per acre under an open canopy; about 500 pounds per acre under a closed canopy
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Grazing of the forage by livestock is limited by windfall in some areas.

**Building site development**

General management considerations:
• Excavation increases the risk of water erosion.
• The quality of roadbeds and road surfaces can be adversely affected by frost action and low strength.
• Septic tank absorption fields can be expected to function poorly because of the limited permeability, which restricts the movement and filtration of the effluent.

### Capability Classification

IVe, nonirrigated

## 140-Turnerville silt loam, 12 to 20 percent slopes

### Composition

Turnerville soil and similar inclusions-85 percent
Contrasting inclusions-15 percent

### Characteristics of the Turnerville Soil

Position on landscape: Loess-covered foothills and canyonsides
Elevation: About 5,800 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 20 inches
Organic mat on surface: 1 inch thick
Typical profile:
0 to 5 inches-pale brown silt loam
5 to 15 inches-light yellowish brown silt loam
15 to 22 inches-very pale brown and yellowish brown silt loam
22 to 33 inches-brown silt loam
33 to 63 inches-light yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Very rapid
Hazard of water erosion: Very severe

### Inclusions

Soils that are similar to the Turnerville soil but have 5 to 25 percent gravel or cobbles throughout (10 percent); Greys silt loam (5 percent)

### Use and Management

Major uses: Woodland, grazable understory
Major management factors: Water erosion, slope, a short growing season

**Woodland**

Common forest overstory plants: Lodgepole pine
Mean site index for lodgepole pine: 79 Estimated average annual production per acre of lodgepole pine: About 68 cubic feet from a stand of trees 100 years old
General management considerations:

- The slope limits the kinds of equipment that can be used in forest management.
- Windthrow is a hazard when the soil is saturated and winds are strong.
- Adequately designed road drainage systems reduce the risk of erosion.
- Rilling and gullying can occur if the soil is disturbed during such activities as the construction of yarding and skid trails and firebreaks.

**Grazable understory**

Common forest understory plants: Pine reedgrass, blue wildrye, mountain brome, Kentucky bluegrass, lupine, sticky geranium, Fendler meadowrue, western yarrow, mountain snowberry, low Oregongrape
Potential annual production of air-dry vegetation: About 1,500 pounds per acre under an open canopy; about 500 pounds per acre under a closed canopy
General management considerations:

- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Grazing of the forage by livestock is limited by windfall in some areas.

### Capability Classification

IVe, nonirrigated

## 141-Vadnais-Hagenbarth-Katseanes silt loams, 1 to 12 percent slopes

### Composition

Vadnais soil and similar inclusions-30 percent
Hagenbarth soil and similar inclusions-25 percent
Katseanes soil and similar inclusions-20 percent
Contrasting inclusions-25 percent

### Characteristics of the Vadnais Soil

Position on landscape: Basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 14 inches-dark yellowish brown silt loam
14 to 28 inches-yellowish brown silt loam
28 to 36 inches-yellowish brown cobbly silty clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Hagenbarth Soil

Position on landscape: Basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 24 inches-brown and yellowish brown silt loam
24 to 38 inches-yellowish brown silty clay loam
38 to 54 inches-light yellowish brown and brown sandy clay loam
54 to 57 inches-brown loamy sand
57 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Katseanes Soil

Position on landscape: Basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 36 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 17 inches-silt loam that is brown in the upper part and yellowish brown in the lower part
17 inches-vesicular basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches

Runoff: Rapid
Hazard of water erosion: Severe

### Inclusions

Soils that are similar to the Katseanes soil but have bedrock at a depth of 0 to 10 inches and Rock outcrop (10 percent); soils that are similar to the Vadnais and Hagenbarth soils but have a layer of lime accumulation above the bedrock or do not have a layer of clay accumulation in the subsoil (5 percent); soils that are similar to the Vadnais, Hagenbarth, and Katseanes soils but have 25 to 40 percent coarse fragments throughout (10 percent)

### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock in some areas, slope, water erosion, risk of seepage, a short growing season
Dominant vegetation in potential natural plant community: Vadnais and Hagenbarth soils-Idaho fescue, Columbia needlegrass, arrowleaf balsamroot, Nevada bluegrass, slender wheatgrass, mountain big sagebrush; Katseanes soil-bluebunch wheatgrass, arrowleaf balsamroot, Idaho fescue, mountain big sagebrush
General management considerations:

- A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
- Seeding of suitable species to improve the range is limited by the depth to bedrock in some areas.
- Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
- Areas where the brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
- The suitability of this unit as a site for livestock watering ponds is fair.

### Capability Classification

IVe, nonirrigated

## 142-Vadnais-Katseanes-Sadorus loams, 2 to 8 percent slopes

### Composition

Vadnais soil and similar inclusions-30 percent
Katseanes soil and similar inclusions-30 percent
Sadorus soil and similar inclusions-15 percent
Contrasting inclusions-25 percent

### Characteristics of the Vadnais Soil

Position on landscape: Side slopes and hillsides in dissected calderas
Elevation: About 5,700 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 24 inches-brown and yellowish brown loam and gravelly loam
24 to 34 inches-light reddish brown clay loam
34 inches-weathered rhyolite
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow Available water
capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Katseanes Soil

Position on landscape: Side slopes in dissected calderas
Elevation: About 5,700 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark grayish brown loam
9 to 18 inches-dark brown and brown loam
18 inches-hard rhyolite
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Sadorus Soil

Position on landscape: Side slopes in dissected calderas
Elevation: About 5,700 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 18 inches
Typical profile. -
0 to 8 inches-dark brown loam
8 to 12 inches-brown loam
12 inches-hard rhyolite
Depth class: Shallow
Drainage class: Well drained

Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Rock outcrop on sharp ridges and in swales (10 percent); Hagenbarth loam, moist (5 percent); soils that are similar to the Vadnais soil but have more than 60 percent stones throughout (5 percent); soils that are similar to the Vadnais soil but have bedrock at a depth of 40 to 60 inches (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Available water capacity in some areas, depth to bedrock in some areas, Rock outcrop in some areas, rooting depth in some areas, water erosion, a short growing season
Dominant vegetation in potential natural plant community: Mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, arrowleaf balsamroot
Common seral species: Snowbrush ceanothus on the Katseanes and Sadorus soils
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• The suitability of this unit as a site for livestock watering ponds is poor.

### Capability Classification

Vls, nonirrigated

## 143-Vadnais-Rin-Katseanes loams, 2 to 20 percent slopes

### Composition

Vadnais soil and similar inclusions-35 percent
Rin soil and similar inclusions-20 percent
Katseanes soil and similar inclusions-20 percent
Contrasting inclusions-25 percent

### Characteristics of the Vadnais Soil

Position on landscape: Side slopes and hillsides in dissected calderas
Elevation: About 5,660 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 24 inches-brown and yellowish brown loam and gravelly loam
24 to 34 inches-light reddish brown clay
34 inches-weathered rhyolitic bedrock
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rin Soil

Position on landscape: Side slopes and hillsides in dissected calderas
Elevation: About 5,620 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 60 inches-light yellowish brown and yellowish brown silt loam
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Very high
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Katseanes Soil

Position on landscape: Side slopes in dissected calderas, hillsides
Elevation: About 5,660 feet
Average annual air temperature: About 40 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 19 inches
Typical profile:
0 to 9 inches-dark grayish brown loam
9 to 18 inches-dark brown and brown loam
18 inches-hard rhyolitic bedrock
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Potential rooting depth: 10 to 20 inches
Runoff. Rapid
Hazard of water erosion: Severe

### Inclusions

Sadorus gravelly loam on plane or convex slopes (10 percent); Rock outcrop (5 percent); soils that are similar to the Vadnais soil but are in plane or convex areas where 1 to 3 percent of the surface is

covered with stones (5 percent); Hagenbarth soils on plane or convex slopes (5 percent)

### Use and Management

Major uses: Rangeland, pasture
Major management factors: Depth to bedrock in some areas, stones on the surface in some areas, Rock outcrop in some areas, rooting depth in some areas, water erosion, plant competition in some areas, a short growing season

**Rangeland**

Dominant vegetation in potential natural plant community: Vadnais soil-mountain big sagebrush, arrowleaf balsamroot, Idaho fescue; Rin soil-mountain snowberry, Woods rose, slender wheatgrass, bluebunch wheatgrass; Katseanes soil-mountain big sagebrush, bluebunch wheatgrass
Common seral species: Snowbrush ceanothus on the Vadnais and Katseanes soils
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the depth to bedrock, stones on the surface in some areas, and plant competition in some areas.
• The use of equipment is limited by the depth to bedrock and by the stones on the surface in some areas.

**Pasture (Rin soil)**

General management considerations:
• Production is limited mainly by the short growing season.

### Capability Classification

IVe, nonirrigated and irrigated

## 144-Vadnais-Rock outcrop-Hagenbarth complex, 1 to 12 percent slopes

### Composition

Vadnais silt loam and similar inclusions-30 percent
Rock outcrop-30 percent
Hagenbarth silt loam and similar inclusions-25 percent
Contrasting inclusions-15 percent

### Characteristics of the Vadnais Soil

Position on landscape: Basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 8 inches-dark brown silt loam
8 to 14 inches-dark yellowish brown silt loam
14 to 28 inches-yellowish brown silt loam
28 to 36 inches-yellowish brown cobbly silty clay loam
36 inches-vesicular basalt
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Rapid
Hazard of water erosion: Severe

### Characteristics of the Rock Outcrop

Position on landscape: Basalt plains
Kind of material: Exposed pressure ridges and nearly level flows of basalt

### Characteristics of the Hagenbarth Soil

Position on landscape: Basalt plains
Elevation: About 6,600 feet
Average annual air temperature: About 39 degrees F
Frost-free period: About 60 days
Average annual precipitation: About 22 inches
Typical profile:
0 to 24 inches-brown and yellowish brown silt loam
24 to 38 inches-yellowish brown silty clay loam
38 to 54 inches-light yellowish brown and brown sandy clay loam
54 to 57 inches-brown loamy sand
57 inches-vesicular basalt
Depth class: Deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Very high
Potential rooting depth: 40 to 60 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Inclusions

Soils that are similar to the Hagenbarth soil but have bedrock at a depth of more than 60 inches (5 percent); soils that are similar to the Vadnais and Hagenbarth soils but do not have a layer of clay accumulation in the subsoil or that have a layer of lime accumulation above the bedrock (5 percent); Katseanes silt loam (5 percent)

### Use and Management

Major use: Rangeland

Major management factors: Depth to bedrock in some areas, risk of seepage, water erosion, slope, a short growing season
Dominant vegetation in potential natural plant community: Idaho fescue, Nevada bluegrass, slender wheatgrass, bluebunch wheatgrass, arrowleaf balsamroot, mountain big sagebrush
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

### Capability Classification

VIe, nonirrigated

## 145-Vadnais-Sadorus- Rock outcrop complex, 2 to 8 percent slopes

### Composition

Vadnais loam and similar inclusions-40 percent
Sadorus gravelly loam and similar inclusions-25 percent
Rock outcrop-20 percent
Contrasting inclusions-15 percent

### Characteristics of the Vadnais Soil

Position on landscape: Hillsides and draws in dissected calderas
Elevation: About 5,500 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 9 inches-dark brown loam
9 to 16 inches-brown loam
16 to 24 inches-yellowish brown loam
24 to 34 inches-light reddish brown clay
34 inches-weathered rhyolitic tuff
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: High
Potential rooting depth: 20 to 40 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Sadorus Soil

Position on landscape: Hillsides and ridges in dissected calderas
Elevation: About 5,500 feet
Average annual air temperature: About 37 degrees F
Frost-free period: About 70 days
Average annual precipitation: About 18 inches
Typical profile:
0 to 17 inches-brown gravelly loam
17 inches-rhyolitic tuff
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Potential rooting depth: 10 to 20 inches
Runoff: Medium
Hazard of water erosion: Moderate

### Characteristics of the Rock Outcrop

Position on landscape: Hillsides, ridges
Kind of material: Exposed areas of rhyolitic tuff

### Inclusions

Soils that are similar to the Vadnais soil but have bedrock at a depth of more than 40 inches (10 percent); soils that are similar to the Sadorus soil but have bedrock within a depth of 10 inches (5 percent)

### Use and Management

Major use: Rangeland
Major management factors: Depth to bedrock, water erosion, Rock outcrop, a short growing season
Dominant vegetation in potential natural plant community: Bluebunch wheatgrass, Idaho fescue, antelope bitterbrush, mountain big sagebrush, arrowleaf balsamroot
Common seral species: Ceanothus
General management considerations:
• A cold soil temperature limits plant growth; therefore, grazing should be delayed until the soil has warmed and the forage plants have achieved sufficient growth.
• Seeding of suitable species to improve the range is limited by the depth to bedrock.
• Seeding the better suited areas is difficult because of the pattern in which they occur with the more poorly suited areas.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Maintaining an adequate plant cover reduces the risk of erosion.

### Capability Classification

VIs, nonirrigated

## 146-Wolverine fine sand, 4 to 15 percent slopes

### Composition

Wolverine soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Wolverine Soil

Position on landscape: Basalt plains
Elevation: About 5,000 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 11 inches
Typical profile:
0 to 15 inches-brown fine sand
15 to 60 inches-pale brown sand
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Runoff: Very slow
Hazard of water erosion: Slight
Hazard of wind erosion: Very severe

### Inclusions

Wolverine soil, bedrock substratum (10 percent); Rock outcrop (5 percent); soils that are similar to the Wolverine soil but have slopes of less than 4 percent (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland, windbreaks
Major management factors: Slope, wind erosion

**Rangeland**

Dominant vegetation in potential natural plant community: Basin big sagebrush, antelope bitterbrush, Indian ricegrass, needleandthread
General management considerations:
• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.
• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.
• Improving the plant cover and accumulating litter on the surface reduce the risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes
General management considerations:
• The best suited irrigation method is a sprinkler system.
• Maintaining crop residue on the surface and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Honeylocust, idahybrid poplar, Russian olive, Rocky Mountain juniper
Shrubs suitable for planting: Siberian peashrub, Nanking cherry, lilac

### Capability Classification

IVe, irrigated; VIIe, nonirrigated

## 147-Wolverine fine sand, bedrock substratum, 4 to 15 percent slopes

### Composition

Wolverine soil and similar inclusions-80 percent
Contrasting inclusions-20 percent

### Characteristics of the Wolverine Soil

Position on landscape: Basalt plains
Elevation: About 4,900 feet
Average annual air temperature: About 42 degrees F
Frost-free period: About 90 days
Average annual precipitation: About 11 inches
Typical profile:
0 to 48 inches-fine sand that is brown in the upper part and pale brown in the lower part
48 inches-basalt
Depth class: Deep
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: Low
Potential rooting depth: 40 to 60 inches
Runoff: Very slow
Hazard of water erosion: Slight Hazard of wind erosion: Very severe

### Inclusions

Soils that are similar to the Wolverine soil but have bedrock at a depth of less than 40 inches or more than 60 inches (10 percent); Rock outcrop (5 percent); soils that are similar to the Wolverine soil but have slopes of more than 15 percent (5 percent)

### Use and Management

Major uses: Rangeland, irrigated cropland, windbreaks
Major management factors: Slope, wind erosion,

instability of cutbanks, available water capacity, risk of seepage, depth to bedrock

**Rangeland**

Dominant vegetation in potential natural plant community: Basin big sagebrush, antelope bitterbrush, Indian ricegrass, needleandthread

General management considerations:

• Seeding of suitable species to improve the range is limited by the very severe hazard of wind erosion.

• Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to a greater risk of erosion.

• Maintaining an adequate plant cover reduces the risk of erosion.

**Irrigated cropland**

Suitable crops: Wheat, barley, alfalfa, potatoes

General management considerations:

• The best suited irrigation method is a sprinkler system.

• Land smoothing should involve only shallow cuts. Deeper cuts can expose the bedrock.

• Keeping tillage to a minimum, using stubble mulch tillage, and seeding a permanent cover of grasses and legumes reduce the risk of wind erosion.

**Windbreaks**

Trees suitable for planting: Honeylocust, green ash, Rocky Mountain juniper

Shrubs suitable for planting: Siberian peashrub, Nanking cherry, lilac

General management considerations.

• Windbreaks help to limit soil losses, maintain optimum crop yields, and protect farm and ranch buildings.

• Irrigation is needed when the trees and shrubs are planted and during dry periods.

## Capability Classification

IVe, irrigated; VIIe, nonirrigated

# Prime Farmland

In this section, prime farmland is defined and the soils in this survey area that are considered prime farmland are listed.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, seed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and length of growing season are favorable, and the level of acidity or alkalinity is acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 8 percent.

Soils that are droughty may qualify as prime farmland soils if this limitation is overcome by irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Soil Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 50,665 acres, or nearly 8 percent of the survey area, would meet the requirements for prime farmland if an adequate and dependable supply of irrigation water were available.

The following map units meet the requirements for prime farmland. On some soils included in the list, irrigation is needed to overcome droughtiness. The need for irrigation is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. Soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

| | |
|---|---|
| 2 | Blacknoll fine sandy loam, 1 to 6 percent slopes (where irrigated) |
| 3 | Blacknoll-Jipper fine sandy loams, 0 to 8 percent slopes (where irrigated) |
| 24 | Greentimber-Marystown-Robinlee silt loams, 1 to 4 percent slopes |
| 37 | Jipper fine sandy loam, 1 to 6 percent slopes |
| 39 | Jipper-Ririe complex, 1 to 6 percent slopes |
| 40 | Jipper-Ririe-Kucera complex, 1 to 8 percent slopes |
| 48 | Kucera-Lostine very fine sandy loams, 1 to 4 percent slopes |
| 49 | Kucera-Lostine silt loams, 0 to 2 percent slopes |

# Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

## Crops and Pasture

By H. Johnson, district conservationist, Soil Conservation Service.

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants commonly grown are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1987, about 245,500 acres in the survey area was used for crops. Of this total, 149,800 acres was irrigated and 95,700 acres was nonirrigated. The dominant crops grown in the survey area are spring barley, spring wheat, potatoes, alfalfa hay, and pasture. Small acreages are used for fall wheat, seed peas, corn, and lentils.

The acreage of cropland in the survey area has increased gradually in recent years as privately owned areas of rangeland in the southwestern part of the survey area have been cultivated and irrigated by sprinklers. A few small areas of woodland in the eastern part also have been cleared and cultivated. More areas are being irrigated, mainly by sprinklers.

The Egin Bench area, which makes up about 28,000 acres, consists of a flat-topped bench that extends about 20 miles along the western side of the Henrys Fork of the Snake River. Subirrigation has been used successfully for several decades in this area, and the water table is referred to locally as "the sub." In recent years, however, there has been a trend away from subirrigation and to sprinkler irrigation because of the desire for higher yields and better quality crops and because of changes in the farm economy. If sprinkler irrigation is used, the water table can be maintained by allowing ditches and canals to fill during the growing season.

Because of topography and slope, water erosion is a major hazard on the nonirrigated cropland, most of which is in the southeastern part of the survey area. The topography in the survey area generally is undulating. Most of the soils have slopes of 4 to 12 percent, but slopes of more than 12 percent also are common.

Erosion can result from snowmelt during spring, rainfall during spring in areas of saturated soils, and heavy thundershowers during summer. The risk of erosion is increased in areas where the soils are occasionally frozen during spring runoff. About 30 percent of the cropland is in areas of Rexburg, Ririe, Kucera, Lostine, Rin, and Tetonia soils that have slopes of more than 4 percent and are considered to be highly erodible if improperly managed. Some fields are divided by gullies that restrict farm machinery.

Productivity is reduced if the surface layer is lost through erosion. As Rexburg, Ririe, and similar soils are eroded, a layer of lime accumulation is exposed and part of the subsoil is incorporated into the surface layer. Loss of the surface layer is especially damaging to soils that have bedrock within a depth of 40 inches, such as Sarilda, Modkin, and Malm soils.

Considerable amounts of sediment can be deposited in streams as a result of erosion and runoff in areas of cropland. Controlling erosion minimizes the pollution of streams and improves the quality of water for municipal use, irrigation, recreation, and fish and wildlife.

Suitable erosion-control practices include those that provide a protective plant cover, break up a plowpan, and increase the rate of water infiltration. A cropping system that includes high-residue crops in the rotation provides a protective cover and increases the organic matter content in the soil. Growing legumes and grasses in the rotation reduces the hazard of erosion, increases the fertility level, and improves tilth.

Conservation tillage leaves crop residue on the surface and thus increases the rate of water infiltration and reduces the rate of runoff and the hazard of erosion. Subsoiling breaks up a tillage pan and other restrictive layers and thus also increases the rate of water infiltration and reduces the rate of runoff.

Terraces help to control runoff and erosion by intercepting water and reducing the length of slopes. Terracing is best suited to deep, well drained soils that have continuous slopes, such as Rexburg, Ririe, Tetonia, and Lantonia soils. Terraces constructed in low-lying, wet areas may hold water for several weeks.

Contour farming is another conservation practice that is suitable on a wide variety of soils in the survey area. This practice is effective on steep slopes because it greatly reduces the risk of water erosion.

Gully erosion is a major problem in nonirrigated areas and the steeper irrigated areas. Grassed waterways can be used where gullies should be reshaped and protected from further erosion. Water and sediment-control basins and dams also are used extensively to control gully erosion and reduce the rate of runoff.

Wind erosion is a hazard on the cropland in the southwestern part of the survey area. Soils that are highly susceptible to wind erosion include those of the Jipper, Grassyridge, Malm, Diston, Blacksan, and Engett series. The risk of wind erosion is highest when winds are strong and the soils are dry and bare of vegetation or crop residue. Maintaining crop residue on the surface and keeping the surface rough and cloddy minimize the risk of wind erosion. Growing windbreaks of suitable trees and shrubs, such as Russian olive, Tatarian honeysuckle, Siberian peashrub, and poplar, also is effective in reducing the risk of wind erosion.

Information about the design of erosion-control practices for specific kinds of soil is available at the district office of the Soil Conservation Service in St. Anthony.

Soil drainage can be a problem in some parts of the survey area. The Egin Bench-Parker area has a seasonal high water table that is used to subirrigate much of the area. Some soils, such as those of the Allwit and Eginbench series, are naturally wet. The subsurface water in these soils is from canals and old stream channels.

Planners of management systems for individual fields or farms should consider the detailed information given in the section "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or of the Cooperative Extension Service.

**Yields Per Acre**

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Potatoes are grown for seed on some soils in the survey area; therefore, the yield appears low because the emphasis is on quality rather than quantity.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each

crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

**Land Capability Classification**

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (14). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils generally are grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

*Capability classes,* the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c*, to the class numeral, for example, IIIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is *very* cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

## Rangeland

By Lex Riggle and John Davis, range conservationists, Soil Conservation Service.

About 58 percent of the survey area is used as range (fig. 6). About 39 percent of the rangeland in the survey area is administered by the Bureau of Land Management. The remaining 61 percent is either privately owned or is administered by the state.

Commercial cow-calf and sheep operations are the primary livestock enterprises in the survey area. There are also some purebred cattle and dairy operations. The forage produced on the rangeland in the western and southern parts of the survey area is used by domestic livestock mainly in spring and fall and by big game and upland game throughout the year. The forage produced in the northern and eastern parts of the survey area is used by domestic livestock in summer and fall. Big game and upland game also use the forage in the

**Figure 6.-Rangeland in an area of Jipper-Nayrib-Stipe complex, 1 to 8 percent slopes, in the foreground. Juniperbute and Wolverine soils are in the background.**

northern part in spring, summer, and fall and in the eastern part throughout the year.

Forage production can be maintained or increased by management practices that help to achieve the proper kind, number, and distribution of livestock and the proper season of use. Such practices as water developments, fencing, and proper salting can be used to manage the vegetation, and such practices as seeding and brush management can be used to hasten desired changes in the plant community.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for nearly all the soils in the survey area, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 6 follows.

*A range site* is a distinctive kind of rangeland that

produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal water table are also important.

*Total production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

*Dry weight* is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

*Characteristic vegetation*-the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil-is listed by common name. Under *composition,* the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimal production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

## Woodland Management and Productivity

About 20,000 acres in the survey area is woodland. Much of this acreage is grazable. Other uses include wildlife habitat, recreation, and woodcutting for heating fuel. For those soils in the survey area that are forested, a brief description of the soil limitations and the harvesting and production limitations is provided in the section "Detailed Soil Map Units." The maximum average annual growth, expressed in cubic feet per acre, also is given for one or more tree species. These growth figures are based on data from yield tables and are ascertained through the use of average site indexes. The site indexes are determined from the appropriate site index curves for each tree species (*1*, *4, 5, 10).* The site indexes for Douglas fir were based on 100-year-old trees so that Meyer's yield tables could be used to determine the growth figures. If growth figures are given for more than one species on a specific soil, the figures represent the potential average annual growth that could be expected in a stand having only one of the tree species.

## Windbreaks and Environmental Plantings

Most of the area south and west of Ashton is subject to high winds. The hazard of wind erosion is severe on the cropland in the extreme southwest corner of the survey area. It also is severe in the Egin-Parker area; the Hog Hollow area, east of St. Anthony; and on unprotected silty and sandy soils in the area extending from Ashton to Teton.

Windbreaks in the survey area are most useful around homesites and around fields that are less than 800 feet wide. Irrigation is needed for at least the first *year* if young trees and shrubs are to become established. Drip irrigation is suitable in areas where water is not readily available.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility

of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 7 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 7 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

## Recreation

The survey area provides year-round opportunities for recreation. Hunting, fishing, hiking, camping, boating, operating off-road vehicles, picnicking, golfing, and sightseeing are the main recreational activities in spring, summer, and fall. In winter the most popular activities are cross-country skiing, snowmobiling, ice fishing, and sightseeing. Special areas of interest are the Henrys Fork of the Snake River, the Teton River, the Falls River, the Island Park Reservoir, and Henrys Lake.

Several miles of continuous sand dunes are west of St. Anthony. They provide opportunities for dune buggy and dirt bike riding, snowmobiling, and cross-country skiing. North of St. Anthony, near Butte Crater, are several multileveled, tubular ice caves that can be explored.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties generally are favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in table 9 and interpretations for septic tank absorption fields in table 10.

*Camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

*Playgrounds* require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

*Paths and trails* for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

*Golf fairways* are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject

to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

## Wildlife Habitat

By Mike W. Anderson, biologist, Soil Conservation Service.

The survey area has large and varied fish and game populations, mainly because of the condition and types of habitat available and because of the northeastern border with Yellowstone National Park.

Big game in the survey area include mule deer, white-tailed deer, elk, moose, bighorn sheep, black bear, grizzly bear, and antelope. According to the Idaho Department of Fish and Game, the deer and elk herds total about 2,000 animals each. There are more than 450 moose in the survey area, and the population appears to be increasing. About 20 bighorn sheep are in the Targhee Creek area. The survey area has about 450 black bear but has fewer grizzly bears. Scattered bands of antelope are in the western part of the survey area in summer.

Big game migration routes and calving areas are throughout the survey area (fig. 7). Elk is the most numerous big game animal that winters in the area. The wintering elk herd grew from about 20 animals late in the 1940's to about 2,300 animals in 1986. A population of more than 3,000 animals was recorded in 1983. Elk from Yellowstone National Park and the surrounding areas of the Targhee and Gallatin National Forests also use the migration routes in the survey area.

Most elk begin to migrate late in November and congregate in the southwestern part of the Island Park area and in the southwest corner of Yellowstone National Park. During mild winters they use these areas for range. By mid-December elk have moved to the Juniper Mountains/Sand Dunes winter range area about 30 miles southwest of Island Park (general soil map unit 8). This range is administered by the Bureau of Land Management and the Idaho Department of Fish and Game in cooperation with the Idaho Department of Lands and private landowners. Most of the elk that use the Island Park, Centennial Mountains, Yellowstone National Park, and Fall River areas in summer spend the winter in this range area. Little snow accumulates in this area because of its southwestern exposure. The area is covered by grass and dense shrubs, including chokecherry, bitterbrush, and big sagebrush (19). During some winters some of the elk move as far south as the Market Lake Wildlife Management Area, south of Highway 33.

In summer elk are primarily distributed throughout the forested parts of the survey area. Use of the habitat varies with the climate and the activities in the area, such as grazing, logging, and recreation. All of the northern and eastern parts of the survey area provide fair summer range for elk. Elk also use habitat in Yellowstone National Park throughout the summer.

Other big game animals that use the Juniper Mountains/Sand Dunes range area are mule deer and moose. About 1,500 to 2,000 deer winter in this area, and an additional 100 to 200 migrate through the narrow corridor along the western side of the sand dunes. The actual numbers vary, depending on the severity of the winter. In some years as many as 50 moose winter in the area. This number is about half of the entire population of moose that winter in the desert brush environment in the southern part of the survey area (18). The forests in the survey area provide fair or good summer range for mule deer. Most of the mule deer that summer in the Island Park area winter in the Juniper Mountains/Sand Dunes area.

Moose are distributed throughout the Island Park area. In summer groups of 2 to 5 moose and individual moose are scattered throughout the various habitat areas. Moose prefer the forest, mountain brush, and riparian habitat types. They intensively use areas that support willows.

The survey area provides extensive winter range for moose. The condition of the range varies throughout the area, but it generally is good. The main winter areas are the Fall River-Warm River Butte area, which receives heavy use during extreme winters; the Big Bend Ridge-Juniper Range area; and the Island Park-Henrys Lake area, mainly along the Henrys Fork of the Snake River and in the Henrys Lake Flat area. Distribution of the moose in these areas is largely determined by the severity of the winter.

During extreme winters, snow depth in the Island Park area can restrict moose. Depths of 6 to 7 feet can result in increased mortality of both old and young animals. The availability of food determines their winter range selection. Important forage species include willow, bitterbrush, chokecherry, serviceberry, aspen, subalpine fir, sedges, and grasses.

Sage grouse, forest grouse, Hungarian partridge, and sharp-tailed grouse are the dominant game birds in the survey area. Sage grouse use areas of sagebrushgrass and mountain brush vegetation (general soil map units 6, 8, 9, 10, and 11) for summer feeding and brood rearing. The preferred habitat for brood rearing is associated with areas on stream bottoms where water is available and meadows provide succulent vegetation.

Sage grouse winter mostly on sagebrush-covered, south-facing slopes and in areas of dense brush near Nine Mile Knoll, the Sand Dunes, and the Juniper Mountains (general soil map unit 8). They also migrate

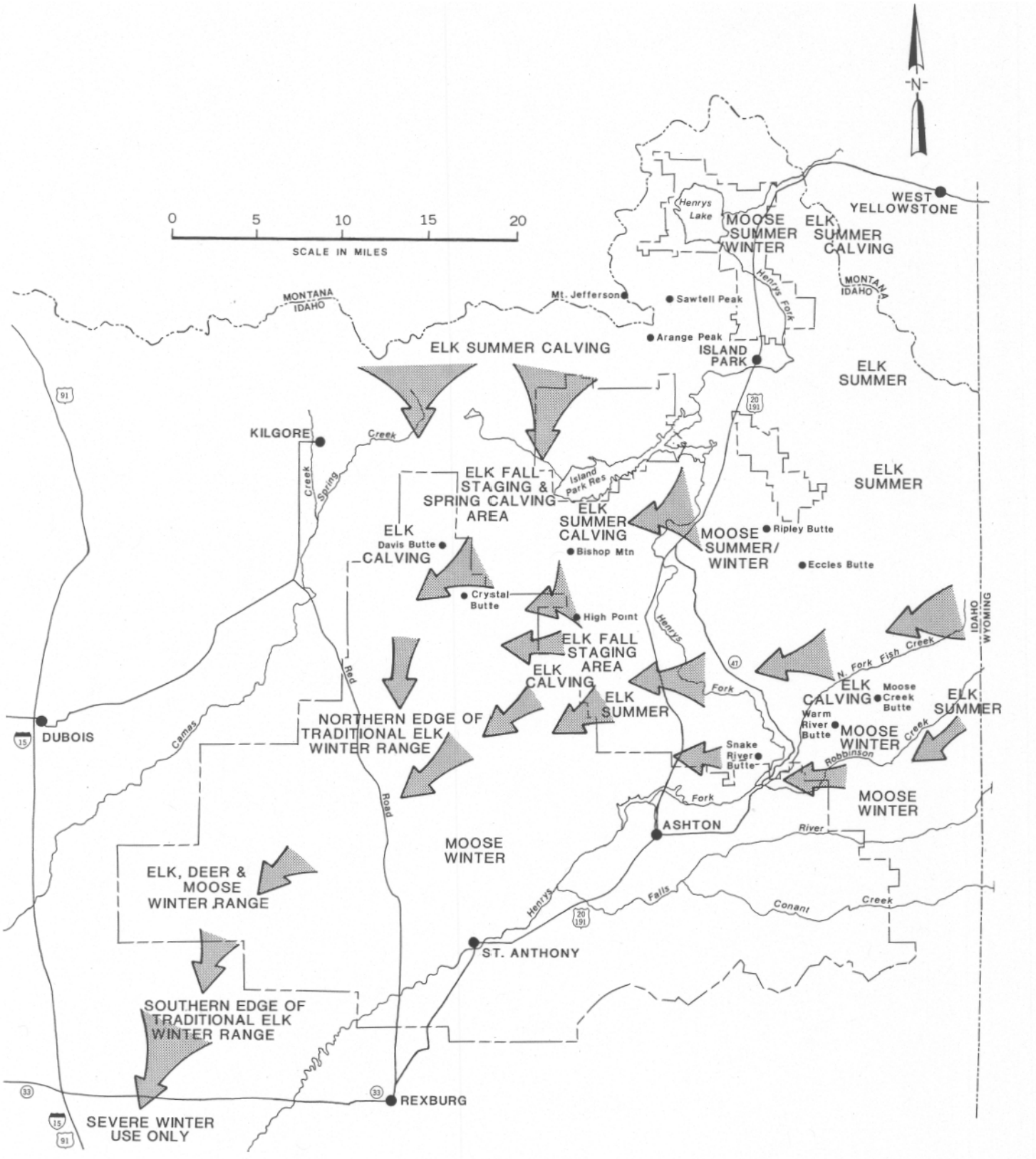


**Figure 7.-Elk and moose migration routes in the survey area.**

through these areas to other areas of winter range farther south and west. Sage grouse is the most abundant game bird species that nests and winters in the southwestern part of the survey area.

Sharp-tailed grouse are not so numerous as sage grouse, but the survey area has the largest population of sharp-tailed grouse in the Upper Snake River Basin. These grouse are classified as a species of special concern by both the Idaho Department of Fish and Game and the Bureau of Land Management.

Blue grouse and ruffed grouse are common throughout the forested parts of the survey area. Blue grouse use most types of habitat, but they move to the higher elevations in winter. They nest on grassy, open slopes and sagebrush-covered ridges, generally at the base of a small tree or shrub. The preferred nesting habitat commonly is at elevations below the mature coniferous forest, which provides conifer needles for food in winter.

Ruffed grouse use most of the types of habitat in the forested parts of the survey area. Although these birds eat a variety of food throughout much of the year, they feed largely on buds from aspen and various other deciduous species in winter.

Migratory and nesting populations of mourning dove are common throughout the survey area. Suitable habitat commonly includes areas of sagebrush-grass and mountain brush vegetation, riparian areas, and areas of cropland, but it also includes some forested areas.

Hungarian partridge is an upland game bird associated with the areas of cropland. It nests in areas of sagebrush-grass vegetation and nonirrigated cropland (alfalfa), and it prefers brushy cover for use as hiding areas and for wintering.

Furbearers, such as otter, mink, beaver, and muskrat, live in and around the streams in the survey area. Weasels, martens, red fox, bobcat, and lynx also reside in the area if conditions are suitable.

The coyote is the primary predator in the survey area. It lives in all parts of the area.

The survey area is in the Pacific waterfowl flyway. More than a million waterfowl migrate over the area in spring and fall. The southward movement begins in mid-to late-August and continues through December. Large numbers of ducks and geese concentrate on and around the Island Park Reservoir and Henrys Lake and in Harriman State Park before moving south. Migrating waterfowl also make extensive use of the Henrys Fork of the Snake River and other watercourses, lakes, marshes, and potholes in the survey area. The northward migration begins late in March and continues through April and May.

Trumpeter swans, which were once an endangered species, winter on the open waters of the Henrys Fork of the Snake River. The area along the river south of Island Park is the most important wintering area for trumpeter swans in the United States and Canada.

Canada geese nest in the survey area, primarily along rivers and streams, small lakes, and potholes. Many migrating geese use the Island Park area for nesting and feeding. Other important waterfowl include the whooping crane and sandhill crane.

About 31 species of birds of prey use the survey area during some part of the year. Some of the more common and highly visible raptors are the bald eagle, golden eagle, osprey, red-tailed hawk, Swanson hawk, Northern harrier, and kestrel.

Of special concern to the State of Idaho are species whose restricted range, specific habitat requirements, or low populations make them vulnerable to adverse conditions. Such species in this survey area include grizzly bear, Northern Rocky Mountain wolf, Canada lynx, fisher, wolverine, trumpeter swan, sharp-tailed grouse, ferruginous hawk, prairie falcon, American peregrine falcon, and Northern bald eagle.

The endangered Northern Rocky Mountain wolf *(Canis lupus irremotus)* inhabits the Island Park area. The American peregrine falcon *(Falco peregrinus anatum),* also an endangered species, nests in the survey area. The endangered Northern bald eagle *(Haliaeetus leucocephalus)* nests in the northern half of the area. In summer the eagles feed extensively on the lakes, rivers, and reservoirs in the area, and some winter in the survey area. The grizzly bear *(Ursus arctos horribilis),* a threatened species, is in areas adjacent to Yellowstone National Park.

Whooping cranes *(Grus americana)* consistently use the Island Park area in spring, summer, and fall.

The major drainageway in the survey area is the Henrys Fork of the Snake River, which flows through general soil map units 1, 2, 3, 4, 5, and 6. The relatively uniform waterflow and water temperature, high natural fertility, and good physical characteristics result in an outstanding cold-water fishery. The part of Henrys Fork that flows through the Island Park area attracts sport fishermen from throughout the United States. It is one of the most important streams in Idaho.

Both native and introduced species of trout and salmon thrive in the lakes and streams in the survey area. Rainbow, cutthroat, brown, and brook trout and coho and kokanee salmon are the dominant species. Whitefish and suckers are in the lakes and streams at the lower elevations throughout the survey area. The natural fisheries of the area are supplemented by fish planting programs in restricted areas.

The most common game fish harvested from the Henrys Fork of the Snake River is wild rainbow trout.

Smaller numbers of hatchery rainbow trout, brook trout, rainbow/cutthroat trout hybrids, and cutthroat trout also are harvested. A few areas of Henrys Fork are stocked with catchable-sized rainbow trout, which make up 11 to 20 percent of the fish harvest. Most of Henrys Fork, however, is managed as a "wild" trout stream.

Most of the tributary rivers and streams of Henrys Fork provide habitat for some fish. Many provide significant spawning and rearing habitat for native cutthroat trout. Kokanee salmon depend on some of these streams. The Fall River, the Warm River, and Robinson Creek are regularly stocked with fish. Many of the smaller streams that provide poor habitat for fish are still very important because they affect the water quality of the other streams.

## Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building Site Development, Sanitary Facilities, Construction Materials, and Water Management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

### Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the

year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

*Dwellings* and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

**Sanitary Facilities**

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features,

and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Sanitary landfills* are areas where solid waste is disposed of by burying it in soil. There are two types of landfill-trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

**Construction Materials**

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as *a probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

*Roadfill is soil* material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and depth to the

water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

*Sand* and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the taxonomic unit descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as *a probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

**Water Management**

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect irrigation, terraces and diversions, and grassed waterways.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts

or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Aquifer-fed excavated ponds* are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

*Irrigation* is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

*Grassed waterways* are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

# Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Taxonomic Units and Their Morphology."

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

*Classification* of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (2) and the Unified soil classification system (3, 11).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

*Rock fragments* larger than 3 inches in diameter are indicated as a percentage of the total soil on a dryweight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and

in nearby areas and on estimates made in the field.

*Liquid limit* and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Taxonomic Units and Their Morphology."

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

*Moist bulk density* is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low,* a change of less than 3 percent; *moderate,* 3 to 6 percent; and *high,* more than 6 percent. *Very high,* more than 9 percent, is sometimes used.

*Erosion factor K* indicates the susceptibility of a soil

to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

*Erosion factor T* is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the amount of stable aggregates 0.84 millimeters in size. These are represented idealistically by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy foams, fine sandy loams, and very fine sandy foams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous foams, silt loams, clay foams, and silty clay foams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay foams, and silty clay foams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous foams and silt foams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt foams that are more than 20 percent clay and noncalcareous clay foams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay foams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In table 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

## Soil and Water Features

Table 15 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Flooding,* the temporary covering of the soil surface

by flowing water, is caused by overflow from streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered to be flooding. Standing water in swamps and marshes or in closed depressional areas is considered to be ponding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable, *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding in any year is 0 to 5 percent), *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding in any year is 5 to 50 percent), and *frequent* that it occurs often under normal weather conditions (the chance of flooding in any year is more than 50 percent).

Duration is expressed as *very brief* (less than 2 days), *brief (2* to 7 days), *long (7* days to 1 month), and *very long* (more than 1 month). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are depth to the seasonal high water table, the kind of water table, and the months of the year that the water table usually is highest. A water table that is seasonally high for less than 1 month is not indicated in the table. An *apparent* water table, which is the only kind recognized in the survey area, is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Table 16 gives estimates of various soil features affecting land use planning that involves engineering considerations.

*Depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

*A cemented pan* is a cemented or indurated subsurface layer at a depth of 5 feet or less. Such a pan causes difficulty in excavation. Pans are classified as thin or thick. A *thin* pan is one that is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. *A thick* pan is one that is more than 3 inches thick if continuously indurated or more than 18 inches thick if it is discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

*Subsidence* is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 16 shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

*Potential frost action* is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in

evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

# Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (15). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeroll (Xer, meaning dry, plus oll, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxerolls (Hapl, meaning minimal horizonation, plus xeroll, the suborder of the Mollisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Calcic identifies the subgroup that has a zone of calcium carbonate accumulation. An example is Calcic Haploxerolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-silty, mixed, frigid Calcic Haploxerolls. .

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

## Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each unit. A pedon, a small three-dimensional area of soil, that is typical of the unit in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (13). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (15). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the unit.

The map units of each taxonomic unit are described in the section "Detailed Soil Map Units."

## Allwit Series

Depth class: Very deep
Drainage class: Poorly drained
Position on landscape: Stream terraces
Parent material: Alluvium
Slope: 0 to 2 percent
Elevation: 4,800 to 5,200 feet
Average annual precipitation: 12 to 16 inches
Average annual air temperature: 41 to 46 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Loamy-skeletal, mixed, frigid Typic Haplaquolls

### Typical Pedon

A-0 to 9 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark gray (10YR 3/1) moist; many fine prominent yellowish red (5YR 4/6) mottles, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; about 20 percent gravel; neutral (pH 7.2); clear smooth boundary.
Bw-9 to 22 inches; brown (7.5YR 5/2) very gravelly sandy loam, dark brown (7.5YR 4/2) moist; many fine distinct strong brown (7.5YR 5/6) mottles, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; about 55 percent gravel; neutral (pH 6.8); gradual smooth boundary.
C-22 to 60 inches; variegated extremely gravelly sand; single grain; loose; about 60 percent gravel and 20 percent cobbles; neutral (pH 6.6).

### Typical Pedon Location

Map unit in which located: Allwit gravelly sandy loam, 0 to 2 percent slopes
Location in survey area: About 1 mile east and 3 miles south of St. Anthony, about 2,630 feet west and 660 feet south of the northeast corner of sec. 19, T. 7 N., R. 41 E.

### Range in Characteristics

Seasonal high water table: 12 inches above to 24 inches below the surface
Depth to sand and gravel: 20 to 40 inches

A horizon:
Value-4 or 5 dry
Chroma-1 to 3 dry or moist
Mottles-few to many that have hue of 5YR or 7.5YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 to 6 dry or moist

Bw horizon:
Hue-10YR or 7.5YR
Value-3 to 5 dry or moist
Chroma-2 to 6 dry or moist
Mottles-distinct and prominent with colors similar to those of the matrix
Texture-very gravelly sandy loam, gravelly sandy loam

C horizon:
Texture-extremely gravelly sand, very gravelly sandy loam
Content of gravel-40 to 65 percent
Content of cobbles-10 to 25 percent

## Blacknoll Series

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Eolian deposits from mixed sources
Slope: 0 to 8 percent
Elevation: 5,000 to 5,600 feet
Average annual precipitation: 12 to 16 inches
Average annual air temperature: 39 to 41 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Coarse-loamy, mixed, frigid Calcic Haploxerolls

### Typical Pedon

A-0 to 10 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and many very fine roots; common fine and many very fine tubular pores; 5 percent gravel; neutral (pH 7.2); clear smooth boundary.
Bw-10 to 14 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and many very fine roots; common fine and many very fine tubular pores; 5 percent gravel; neutral (pH 7.3); clear smooth boundary.
Bk-14 to 30 inches; light gray (10YR 7/2) fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and few very fine tubular pores; 10 percent gravel and cobbles; violently effervescent; moderately alkaline (pH 8.4); clear smooth boundary.
2R-30 inches; unweathered vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Blacknoll-Nayrib complex, 1 to 6 percent slopes

Location in survey area: About 9 miles north and 11 miles west of Parker, about 2,220 feet south and 2,350 feet east of the northwest corner of sec. 28, T. 9 N., R. 38 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Depth to secondary lime: 10 to 22 inches
Thickness of the mollic epipedon: 10 to 16 inches

Particle-size control section:
- Content of clay-6 to 18 percent
- Content of rock fragments-5 to 15 percent

A horizon:
- Value-4 or 5 dry
- Chroma-2 or 3 dry or moist

Bw horizon:
- Value-5 or 6 dry, 3 or 4 moist
- Chroma-2 or 3 dry or moist
- Texture-sandy clay loam, fine sandy loam
- Reaction-neutral to moderately alkaline

Bk horizon:
- Value-6 or 7 dry, 4 or 5 moist
- Chroma-2 or 3 dry or moist
- Texture-fine sandy loam, loam, very fine sandy loam
- Reaction-neutral to moderately alkaline
- Content of carbonates-5 to 15 percent

## Blacksan Series

Depth class: Moderately deep
Drainage class: Excessively drained
Position on landscape: Undulating basalt plains
Parent material: Sandy eolian material
Slope: 1 to 6 percent
Elevation: 4,900 to 5,450 feet
Average annual precipitation: 14 to 18 inches
Average annual air temperature: 41 to 43 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Sandy, mixed, frigid Entic Haploxerolls

**Typical Pedon**

A-0 to 10 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable; common very fine and fine roots; few very fine tubular pores; neutral (pH 7.0); clear smooth boundary.

AB-10 to 19 inches; dark grayish brown (10YR 4/2) fine sand, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable; common very fine and fine roots; few very fine tubular pores; 1 percent gravel; neutral (pH 7.0); gradual smooth boundary.

Bw-19 to 32 inches; brown (10YR 4/3) fine sand, dark brown (10YR 3/3) moist; massive; soft, very friable; 5 percent gravel; neutral (pH 7.2); abrupt wavy boundary.

2R-32 inches; vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Area of Engett, bedrock substratum-Engett-Blacksan complex, 1 to 6 percent slopes, that supports grasses and shrubs

Location in survey area: About 5 miles north of St. Anthony, about 2,000 feet west and 1,450 feet south of the northeast corner of sec. 12, T. 8 N., R. 40 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Content of clay in the particle-size control section: 2 to 8 percent
Other features: An AC horizon in some pedons

A horizon:
- Value-3 or 4 dry, 2 or 3 moist
- Chroma-2 to 4 dry, 2 or 3 moist
- Reaction-neutral or mildly alkaline

Bw horizon:
- Value-4 to 6 dry, 3 to 5 moist
- Chroma-2 to 4 dry or moist
- Texture-sand, fine sand, loamy fine sand
- Content of rock fragments-0 to 10 percent
- Reaction-neutral or mildly alkaline

## Booneville Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Canyons, mountainsides
Parent material: Residuum, side slope alluvium
Slope: 10 to 50 percent
Elevation: 5,680 to 6,810 feet
Average annual precipitation: 22 to 27 inches
Average annual air temperature: 35 to 37 degrees F
Frost-free period: 35 to 55 days

**Taxonomic class:** Loamy-skeletal, mixed Argic Pachic Cryoborolls

### Typical Pedon

Oe-1 inch to 0; partially decomposed needles, leaves, and twigs.

A1-0 to 4 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; weak medium platy structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few fine interstitial pores; 15 percent gravel; neutral (pH 7.0); clear smooth boundary.

A2-4 to 11 inches; brown (10YR 4/3) very gravelly sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few fine and medium tubular pores; 40 percent gravel; neutral (pH 7.0); clear smooth boundary.

Bt1-11 to 21 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few fine and medium tubular pores; few thin clay films on faces of peds; 50 percent gravel; neutral (pH 6.8); clear smooth boundary.

Bt2-21 to 32 inches; pale brown (10YR 6/3) extremely gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; few fine and medium tubular pores; few thin clay films on faces of peds; 60 percent gravel; neutral (pH 6.8); clear smooth boundary.

BC-32 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; few fine tubular pores; 60 percent gravel; neutral (pH 6.6).

### Typical Pedon Location

Map unit in which located: Booneville-Hagenbarth, moist complex, 10 to 50 percent slopes (fig. 8)

Location in survey area: About 16 miles north and 6 miles east of St. Anthony, about 2,200 feet east and 1,500 feet south of the northwest corner of sec. 13, T. 10 N., R. 41 E.

Figure 8.-Profile of Booneville gravelly loam, in an area of Booneville-Hagenbarth, moist complex, 10 to 50 percent slopes.

### Range in Characteristics

Thickness of the mollic epipedon: 20 to 35 inches

Content of clay: 22 to 30 percent throughout the profile

A horizon:
- Value-3 to 5 dry, 2 or 3 moist
- Chroma-2 or 3 dry or moist
- Content of rock fragments-15 to 40 percent

Bt1 horizon:
- Hue-7.5YR or 10YR
- Value-4 or 5 dry, 3 or 4 moist
- Chroma-2 or 3 dry or moist

Bt2 horizon:
- Hue-7.5YR or 10YR
- Value-5 or 6 dry, 3 or 4 moist
- Chroma-3 or 4 dry or moist

BC horizon:
Hue-7.5YR or 10YR
Value-5 or 6 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist

**Bootjack Series**

Depth class: Very deep
Drainage class: Poorly drained
Position on landscape: Flood plains, stream terraces
Parent material: Stream deposits
Slope: 0 to 1 percent
Elevation: 6,600 to 7,500 feet
Average annual precipitation: 20 to 30 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Fine-loamy over sandy or sandy-skeletal, mixed Aeric Cryaquepts

**Typical Pedon**

Oi-1.5 inches to 0; undecomposed roots of grasses and sedges.
Ag-0 to 4 inches; grayish brown (10YR 5/2) silty clay loam, black (10YR 2/1) moist; few fine prominent dark yellowish brown (10YR 3/6 moist) mottles; moderate medium subangular blocky structure parting to strong fine granular; hard, firm, sticky and plastic; many very fine and fine roots; medium acid (pH 5.8); abrupt wavy boundary.
Bg-4 to 12 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; common fine prominent dark yellowish brown (10YR 4/6 moist) and few fine faint dark grayish brown (10YR 4/2 moist) mottles; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine roots; slightly acid (pH 6.4); clear smooth boundary.
Bw1-12 to 18 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; many fine and medium prominent dark yellowish brown (10YR 4/6 moist) and common fine faint grayish brown (10YR 5/2 moist) mottles; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine roots; slightly acid (pH 6.4); clear wavy boundary.
Bw2-18 to 23 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; many large prominent dark gray (5Y 4/1 moist) and many medium prominent dark yellowish brown (10YR 4/6 moist) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine roots; 10 percent gravel; slightly acid (pH 6.4); clear wavy boundary.
2C-23 to 60 inches; light gray (10YR 7/2) extremely gravelly loamy coarse sand, dark grayish brown (10YR 4/2) moist; single grain; loose; 70 percent gravel; neutral (pH 7.0).

**Typical Pedon Location**

Map unit in which located: Bootjack silty clay loam, 0 to 1 percent slopes
Location in survey area: About 3 miles east and 4 miles north of Macks Inn, about 990 feet north and 1,980 feet east of the southwest corner of sec. 9, T. 14 N., R. 44 E.

**Range in Characteristics**

Depth to sand and gravel: 20 to 40 inches
Depth to the seasonal high water table: 0 to 18 inches
A horizon.
Value-4 to 6 dry, 2 or 3 moist
Chroma-1 or 2
Reaction-medium acid or slightly acid
B horizon:
Hue-10YR or 2.5Y
Value-6 or 7 dry, 4 or 5 moist
Texture-silt loam, loam, clay loam, gravelly loam
Content of rock fragments-0 to 20 percent
Reaction-slightly acid or neutral
2C horizon:
Hue-10YR or 2.5Y Value-6 or 7 dry
Chroma-1 or 2 dry or moist
Texture-extremely gravelly loamy coarse sand, very gravelly coarse sand
Reaction-slightly acid or neutral

**Chickreek Series**

Depth class: Very deep
Drainage class: Poorly drained
Position on landscape: Flood plains, stream terraces
Parent material: Stream deposits derived from diatomaceous earth in the upper part and from various kinds of rock in the lower part
Slope: 0 to 1 percent
Elevation: 6,280 to 6,300 feet
Average annual precipitation: 25 to 35 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Fine-silty over sandy or sandy skeletal, mixed, nonacid Typic Cryaquents

**Typical Pedon**

Oi-0 to 4 inches; dark grayish brown (10YR 4/2), slightly decomposed fibric material, very dark brown

(10YR 2/2) rubbed; about 80 percent fibers, 65 percent rubbed; massive; herbaceous fibers; about 5 percent mineral material; slightly acid (pH 6.2); clear smooth boundary.

Oa-4 to 7 inches; gray (10YR 5/1), highly decomposed sapric material, black (10YR 2/1) rubbed; about 25 percent fibers, 10 percent rubbed; massive; about 70 percent mineral material; slightly acid (pH 6.5); abrupt smooth boundary.

Ag-7 to 14 inches; light gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; moderate thick and very thick platy structure parting to moderate medium and coarse subangular blocky; hard, firm, slightly sticky; common very fine, fine, and medium roots; neutral (pH 6.8); clear smooth boundary.

Cg1-14 to 22 inches; white (5Y 8/1) silty clay loam, gray (10YR 5/1) moist; moderate thick and very thick platy structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky; few very fine, fine, and medium roots; neutral (pH 6.8); clear smooth boundary.

Cg2-22 to 31 inches; white (2.5Y 8/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable, sticky and plastic; neutral (pH 7.0); clear smooth boundary.

2C1-31 to 34 inches; light brownish gray (10YR 6/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure; soft, friable; neutral (pH 6.8); clear smooth boundary.

3C2-34 to 54 inches; variegated sand; single grain; loose; neutral (pH 7.0); gradual smooth boundary.

3C3-54 to 67 inches; variegated extremely gravelly sand; single grain; neutral (pH 7.2).

### Typical Pedon Location

Map unit in which located: Chickreek mucky peat, ponded, 0 to 1 percent slopes

Location in survey area: About 2 miles east of Island Park Ranger Station, about 1,440 feet north and 2,640 feet east of the southwest corner of sec. 25, T. 13 N., R. 43 E.

### Range in Characteristics

Depth to sand and gravel: 20 to 40 inches

Seasonal high water table: 12 inches above to 18 inches below the surface

A horizon:
- Value-5 to 7 dry, 3 or 4 moist
- Chroma-1 or 2 dry or moist

Cg horizon:
- Hue-dominantly variegated, but 5Y to 5YR dry
- Value-6 to 8 dry, 3 to 6 moist
- Chroma-0 to 6 dry
- Texture-silt loam, silty clay loam

2C and 3C horizons:
- Texture-sand, sandy loam, gravelly to extremely gravelly sand
- Reaction-slightly acid to mildly alkaline

## Cryoborolls

Depth class: Shallow to very deep

Drainage class: Well drained

Position on landscape: Canyonsides, ravines

Parent material: Side slope alluvium, colluvium, loess

Slope: 0 to 1 percent

Elevation: 5,500 to 8,000 feet

Average annual precipitation: 16 to 22 inches

Average annual air temperature: 40 to 43 degrees F

Frost-free period: 50 to 80 days

### Reference Pedon

A-0 to 6 inches; variable texture and color.

B-6 to 25 inches; grayish brown (10YR 5/2) stony loam, very dark grayish brown (10YR 3/2) moist; blocky structure; common roots; few pores; neutral.

R-25 inches; unweathered bedrock.

### Reference Pedon Location

Map unit in which located: Cryoborolls-Haploxerolls Rock outcrop association, very steep

Location in survey area: About 8 miles east and 3 miles north of Ashton; T. 48 N., R. 44 E.

### Range in Characteristics

Depth to bedrock: 10 to more than 60 inches

Thickness of the mollic epipedon: 10 to more than 40 inches

## Crystalbutte Series

Depth class: Very deep

Drainage class: Well drained

Position on landscape: Basalt plains, mountainsides, hills

Parent material: Alluvium derived from various kinds of rock, cinders

Slope: 1 to 30 percent

Elevation: 6,240 to 7,000 feet

Average annual precipitation: 20 to 24 inches

Average annual air temperature: 35 to 39 degrees F

Frost-free period: 40 to 80 days

**Taxonomic class:** Fine-loamy, mixed Argic Pachic Cryoborolls

**Typical Pedon**

A1-0 to 5 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine tubular pores; 5 percent gravelsized cinders; slightly acid (pH 6.2); clear smooth boundary.

A2-5 to 11 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; 5 percent gravel-sized cinders; slightly acid (pH 6.4); clear smooth boundary.

AB-11 to 16 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; 10 percent gravel-sized cinders; neutral (pH 6.8); clear smooth boundary.

Bt1-16 to 23 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; common very fine tubular pores; few thin clay films on faces of peds and lining tubular pores; 10 percent gravel-sized cinders; neutral (pH 7.0); clear wavy boundary.

2Bt2-23 to 40 inches; dark brown (10YR 3/3) very cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; common fine and few medium roots; many very fine tubular pores; common moderately thick clay films on faces of peds and lining tubular pores; 10 percent gravel-sized cinders and 35 percent subangular vesicular basalt cobbles; neutral (pH 7.2); gradual wavy boundary.

2BC-40 to 60 inches; dark brown (10YR 3/3) very cobbly loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common very fine tubular pores; 15 percent gravel-sized cinders; 40 percent subangular vesicular basalt cobbles; neutral (pH 7.2).

**Typical Pedon Location**

Map unit in which located: Crystalbutte-VadnaisKatseanes complex, 1 to 30 percent slopes

Location in survey area: About 1 mile west and 2 miles south of the Fogg Butte well, about 2,030 feet west and 300 feet north of the southeast corner of sec. 13, T. 11 N., R. 40 E.

**Range in Characteristics**

Depth to the argillic horizon: 12 to 24 inches

Thickness of the mollic epipedon: 16 to 30 inches

Particle-size control section:
- Content of clay-26 to 34 percent
- Content of rock fragments-25 to 35 percent

A horizon:
- Hue-5YR to 10YR
- Value-3 or 4 dry, 2 or 3 moist
- Chroma-1 or 2 dry or moist
- Reaction-neutral or slightly acid

Bt horizon:
- Hue-5YR to 10YR
- Value-3 to 5 dry, 2 or 3 moist
- Chroma-2 to 6 dry or moist
- Texture-loam, cobbly loam, very cobbly loam, cobbly clay loam

BC horizon:
- Hue-5YR to 10YR
- Value-3 to 5 dry, 2 to 4 moist
- Chroma-2 to 6 dry or moist
- Texture-very cobbly loam, extremely cobbly loam

**Diston Series**

Depth class: Moderately deep to a hardpan

Drainage class: Somewhat excessively drained

Position on landscape: Basalt plains

Parent material: Eolian material derived from calcareous sand

Slope: 1 to 4 percent

Elevation: 4,920 to 5,150 feet

Average annual precipitation: 9 to 11 inches

Average annual air temperature: 41 to 44 degrees F

Frost-free period: 80 to 100 days

**Taxonomic class:** Sandy, mixed, frigid Xerollic Durorthids

**Typical Pedon**

Ap-0 to 10 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; single grain; loose; common fine and very fine roots; many fine and very fine interstitial pores; 10 percent duripan fragments less than 0.75 inch in diameter; moderately alkaline (pH 7.9); clear smooth boundary.

Bk-10 to 32 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 5/3) moist; weak medium

subangular blocky structure; very friable; common fine and very fine roots; many fine and very fine interstitial pores; about 10 percent duripan fragments less than 0.75 inch in diameter; violently effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary.

Bqkm-32 to 34 inches; white (10YR 8/2) duripan, very pale brown (10YR 8/3) moist; abrupt wavy boundary.

Bqk-34 to 60 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; massive; slightly hard, friable; common fine tubular pores; moderately alkaline (pH 8.3).

### Typical Pedon Location

Map unit in which located: Diston-Grassyridge complex, 1 to 4 percent slopes

Location in survey area: About 1 mile north and 14 miles west of Parker, about 1,450 feet west and 1,375 feet south of the northeast corner of sec. 36, T. 8 N., R. 37 E.

### Range in Characteristics

Depth to the duripan: 20 to 40 inches

Depth to secondary lime: 10 to 20 inches

A horizon:
Value-5 or 6 dry, 3 or 4 moist
Chroma-2 or 3 dry or moist

Bk horizon:
Value-5 to 7 dry, 3 to 5 moist
Chroma-2 to 4 dry or moist

Bqkm horizon:
Hue-2.5Y or 10YR
Value-7 or 8 dry, 6 or 7 moist
Chroma-1 to 3 dry or moist

### Classification Features

Mollic colors are the result of mineral material rather than organic material. The A horizon has been leached of lime.

## Eginbench Series

Depth class: Very deep

Drainage class: Somewhat poorly drained (water table induced by irrigation canals)

Position on landscape: River terraces, depressions on basalt plains

Parent material: Eolian material over alluvium

Slope: 0 to 2 percent

Elevation: 4,900 to 5,040 feet

Average annual precipitation: 11 to 14 inches

Average annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 100 days

**Taxonomic class:** Mixed, frigid Xeric Torripsamments

### Typical Pedon

Ap-0 to 11 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark brown (10YR 2/2) moist; weak medium granular structure; very soft, very friable; 10 percent gravel; neutral (pH 7.0); clear smooth boundary.

AC-11 to 17 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; few fine faint dark brown (10YR 3/3 moist) mottles; weak medium subangular blocky structure; very soft, very friable; 10 percent fine gravel; neutral (pH 7.2); clear smooth boundary.

C1-17 to 26 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; many medium distinct dark yellowish brown (10YR 3/4 moist) mottles; weak medium subangular blocky structure; soft, very friable; 10 percent fine gravel; mildly alkaline (pH 7.6); clear wavy boundary.

C2-26 to 37 inches; brown (10YR 5/3) coarse sand, very dark grayish brown (10YR 3/2) moist; many large prominent dark yellowish brown (10YR 3/6 moist) mottles; single grain; loose; 10 percent fine gravel; neutral (pH 7.2); gradual smooth boundary.

C3-37 to 60 inches; gray (10YR 5/1) coarse sand, very dark gray (10YR 3/1) moist; single grain; loose; 10 percent fine gravel; mildly alkaline (pH 7.4).

### Typical Pedon Location

Map unit in which located: Eginbench loamy fine sand, 0 to 2 percent slopes

Location in survey area: About 1 mile south and 2 miles west of Parker, about 150 feet east and 1,750 feet south of the northwest corner of sec. 18, T. 7 N., R. 40 E.

### Range in Characteristics

Depth to the seasonal high water table: 12 to 48 inches

Reaction: Neutral to moderately alkaline throughout the profile

Content of rock fragments in the particle-size control section: 0 to 15 percent

A horizon.

Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

AC horizon:
Value-4 or 5 dry, 3 or 4 moist
Chroma-2 or 3 dry or moist

C horizon:
Value-5 or 6 dry, 2 to 5 moist
Chroma-1 to 3 dry or moist

## Engett Series

Depth class: Deep or very deep
Drainage class: Somewhat excessively drained
Position on landscape: Basalt plains
Parent material: Eolian material and some slope alluvium
Slope: 1 to 6 percent
Elevation: 4,900 to 5,450 feet
Average annual precipitation: 14 to 18 inches
Average annual air temperature: 41 to 43 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Sandy, mixed, frigid Entic Haploxerolls

### Typical Pedon

A1-0 to 6 inches; brown (10YR 4/3) fine sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable; common very fine and fine roots; few very fine irregular pores; neutral (pH 6.8); clear smooth boundary.
A2-6 to 20 inches; brown (10YR 4/3) fine sand, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable; common very fine and fine roots; few very fine irregular pores; neutral (pH 7.0); gradual smooth boundary.
Bw1-20 to 46 inches; brown (10YR 4/3) fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; common very fine and fine roots; few very fine irregular pores; neutral (pH 7.0); clear wavy boundary.
Bw2-46 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few very fine roots; neutral (pH 7.0).

### Typical Pedon Location

Map unit in which located: Engett, bedrock substratum-Engett-Blacksan complex, 1 to 6 percent slopes
Location in survey area: About 6 miles north of St. Anthony, about 1,175 feet south and 150 feet east of the northwest corner of sec. 4, T. 8 N., R. 41 E.

### Range in Characteristics

Depth to bedrock: 40 to more than 60 inches
Content of clay in the particle-size control section: 2 to 8 percent
Other features: An AB horizon in some pedons

A horizon:
Value-3 or 4 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Reaction-neutral or mildly alkaline

Bw horizon:
Value-4 to 6 dry, 3 or 4 moist
Chroma-2 to 4 dry or moist
Texture-fine sand, sand, loamy fine sand, cobbly sand
Reaction-neutral or mildly alkaline

## Fluvaquents

Depth class: Very deep
Drainage class: Very poorly drained
Position on landscape: Drainageways, flood plains
Parent material: Alluvium
Elevation: 4,800 to 5,100 feet
Slope: 0 to 1 percent
Average annual precipitation: 13 to 17 inches
Average annual air temperature: 41 to 44 degrees F
Frost-free period: About 90 to 100 days

### Reference Pedon

A-0 to 30 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; blocky structure; many roots; many pores; mildly alkaline.
C-30 to 60 inches; light gray (10YR 7/2) very gravelly sandy loam, olive gray (5Y 4/2) moist; massive; neutral.

### Reference Pedon Location

Map unit in which located: Fluvaquents, 0 to 1 percent slopes
Location in survey area: About 8 miles west and 5 miles south of St. Anthony; T. 46 N., R. 42 E.

### Range in Characteristics

Water table: 12 inches above to 12 inches below the surface from May through October; below a depth of 12 inches during the rest of the year

## Fourme Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Fan terraces
Parent material: Alluvium derived from quartzite, sandstone, and limestone
Slope: 0 to 4 percent
Elevation: 6,100 to 6,580 feet
Average annual precipitation: 18 to 26 inches
Average annual air temperature: 34 to 38 degrees F
Frost-free period: 30 to 60 days

**Taxonomic class:** Loamy-skeletal, mixed Argic Cryoborolls

**Typical Pedon**

A-0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, friable, slightly plastic; 10 percent gravel; slightly acid (pH 6.4); clear smooth boundary.

BA-5 to 15 inches; yellowish brown (10YR 5/4) gravelly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few thin clay films bridging sand grains; 15 percent gravel; neutral (pH 6.6); gradual wavy boundary.

Bt1-15 to 23 inches; yellowish brown (10YR 5/4) very gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; few thin clay films bridging mineral grains; 30 percent gravel and 5 percent cobbles; mildly alkaline (pH 7.5); gradual wavy boundary.

Bt2-23 to 32 inches; variegated, dominantly light yellowish brown (10YR 6/4) extremely gravelly sandy clay loam, dominantly dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; few thin clay films bridging sand grains; 40 percent gravel and 20 percent cobbles; mildly alkaline (pH 7.7); gradual wavy boundary.

C-32 to 60 inches; variegated extremely gravelly sand, dominantly yellowish brown (10YR 5/4) moist; single grain; loose; 40 percent gravel and 20 percent cobbles; moderately alkaline (pH 8.0).

**Typical Pedon Location**

Map unit in which located: Fourme loam, 0 to 4 percent slopes

Location in survey area: About 2 miles south and 5 miles east of the southwest corner of Henrys Lake, about 2,380 feet south and 1,190 feet west of the northeast corner of sec. 25, T. 15 N., R. 43 E.

**Range in Characteristics**

Depth to sand and gravel: 20 to 40 inches Thickness of the mollic epipedon: 10 to 15 inches

Reaction: Slightly acid to moderately alkaline throughout the profile

Content of clay in the particle-size control section: 20 to 30 percent

A horizon:
- Value-3 to 5 moist
- Chroma-2 or 3 dry or moist
- Content of rock fragments-5 to 14 percent

Bt horizon:
- Hue-7.5YR, 10YR, or variegated
- Value-4 to 6 dry, 3 or 4 moist
- Chroma-3 to 6 dry or moist
- Texture-gravelly loam, very gravelly sandy clay loam, extremely gravelly clay loam, extremely gravelly sandy clay loam, very gravelly clay loam

C horizon:
- Hue-variegated, 7.5YR, or 10YR
- Value-3 to 6 dry or moist
- Chroma-4 to 6 dry or moist
- Texture-extremely gravelly sand, extremely gravelly coarse sand

**Grassyridge Series**

Depth class: Deep or very deep
Drainage class: Somewhat excessively drained
Position on landscape: Basalt plains
Parent material: Eolian deposits
Slope: 1 to 20 percent
Elevation: 5,250 to 5,700 feet
Average annual precipitation. 9 to 12 inches
Average annual air temperature: 41 to 44 degrees F
Frost-free period: 87 to 95 days

**Taxonomic class:** Sandy, mixed, frigid Xerollic Calciorthids

**Typical Pedon**

A-0 to 8 inches; brown (10YR 5/3) sand, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; very friable; many very fine and fine and common coarse roots; many very fine interstitial pores; about 0.4 percent organic carbon; slightly effervescent; mildly alkaline (pH 7.6); clear wavy boundary.

Bk1-8 to 28 inches; brown (10YR 5/3) fine sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; common very fine, fine, and coarse roots; many very fine interstitial pores; strongly effervescent; mildly alkaline (pH 7.8); gradual wavy boundary.

Bk2-28 to 49 inches; grayish brown (10YR 5/2) fine sand, dark gray (10YR 4/1) moist; single grain; loose; few very fine roots; common very fine interstitial pores; violently effervescent; moderately alkaline (pH 8.0); gradual wavy boundary.

C-49 to 60 inches; gray (10YR 5/1) fine sand, very dark gray (10YR 3/1) moist; single grain; loose; few

very fine roots; few very fine interstitial pores; slightly effervescent; moderately alkaline (pH 7.9).

**Typical Pedon Location**

Map unit in which located: Grassyridge sand, 2 to 20 percent slopes
Location in survey area: About 14 miles west and 4 miles north of St. Anthony, about 1,450 feet west and 225 feet south of the northeast corner of sec. 15, T. 8 N., R. 38 E.

**Range in Characteristics**

Depth to bedrock: 40 to more than 60 inches
Depth to secondary lime: 4 to 8 inches
Content of clay in the particle-size control section: 5 to 10 percent

A horizon:
Value-4 or 5 dry
Chroma-2 or 3 dry or moist

Bk horizon:
Value-5 to 7 dry, 3 to 5 moist
Chroma-1 to 3 dry or moist
Calcium carbonate equivalent-5 to 15 percent
Texture-fine sand, loamy sand

C horizon:
Value-3 or 4 moist

**Greentimber Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Undulating to rolling plains, moraines
Parent material: Glacial till, glacial drift, and some loess
Slope: 1 to 4 percent
Elevation: 5,300 to 5,700 feet
Average annual precipitation. 16 to 22 inches
Average annual air temperature: 39 to 43 degrees F
Frost-free period: 75 to 85 days
**Taxonomic class:** Fine, montmorillonitic, frigid Pachic Palexerolls

**Typical Pedon**

Ap-0 to 6 inches; dark brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine tubular pores; about 1 percent gravel; medium acid (pH 5.8); abrupt smooth boundary.
AB-6 to 20 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; about 1 percent gravel; medium acid (pH 6.0); abrupt wavy boundary.
Bt-20 to 31 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse prismatic structure parting to strong fine prismatic; very hard, very firm, sticky and plastic; common very fine and few fine roots; few very fine and common fine tubular pores; common uncoated silt grains on faces of peds; many moderately thick clay films on faces of peds and lining pores; about 5 percent gravel; slightly acid (pH 6.4); clear wavy boundary.
Btb1-31 to 57 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; strong coarse prismatic structure parting to strong medium angular blocky; very hard, very firm, sticky and plastic; few very fine and fine roots; few fine tubular pores; many thin clay films on faces of peds; about 5 percent gravel and 1 percent cobbles; slightly acid (pH 6.4); clear wavy boundary.
Btb2-57 lo 60 inches; yellowish brown (10YR 5/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; few fine tubular pores; few thin clay films on faces of peds; about 20 percent gravel and 10 percent cobbles; slightly acid (pH 6.4).

**Typical Pedon Location**

Map unit in which located: Greentimber-MarystownRobinlee silt loams, 1 to 4 percent slopes
Location in survey area: About 6 miles east and 1 mile north of Marysville, about 1,000 feet north and 250 feet west of the southeast corner of sec. 18, T. 9 N., R. 44 E.

**Range in Characteristics**

Particle-size control section:

Content of clay-35 to 45 percent
Content of gravel-1 to 10 percent
Content of cobbles and stones-0 to 5 percent

Ap and AB horizons:
Value-4 or 5 dry
Chroma-2 or 3 dry or moist

Bt horizon:
Value-4 or 5 dry, 3 or 4 moist
Texture-silty clay loam, clay loam

Btb1 horizon:
Hue-7.5YR or 10YR

Value-4 or 5 dry, 3 or 4 moist
Chroma-3 or 4 dry or moist
Texture-clay loam, clay, silty clay

Btb2 horizon:
Hue-7.5YR or 10YR
Value-4 or 5 dry, 3 or 4 moist
Chroma-3 or 4 dry or moist
Texture-gravelly clay loam, gravelly clay, very gravelly clay loam
Content of gravel-15 to 25 percent
Content of cobbles and stones-3 to 20 percent

**Greys Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Foothills
Parent material: Loess
Slope: 1 to 20 percent
Elevation: 5,680 to 6,230 feet
Average annual precipitation: 16 to 22 inches
Average annual air temperature: 37 to 40 degrees F
Frost-free period: 50 to 70 days

**Taxonomic class:** Fine-silty, mixed Boralfic Cryoborolls

**Typical Pedon**

Ap1-0 to 5 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak very thick platy structure parting to moderate coarse angular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; medium acid (pH 5.6); abrupt smooth boundary.

Ap2-5 to 10 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate very thick platy structure parting to moderate coarse angular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; slightly acid (pH 6.2); abrupt smooth boundary.

BE-10 to 19 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure parting to strong very fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine, fine, and medium tubular pores; few thin clay films on faces of peds; slightly acid (pH 6.5); abrupt wavy boundary.

Bt1-19 to 33 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky; hard, firm, sticky and plastic; many very fine, common fine, and common medium decayed roots; many very fine, fine, medium, and coarse tubular pores; many thick clay films on faces of peds and lining pores; common uncoated silt grains on faces of peds; about 10 percent krotovinas; neutral (pH 6.6); gradual wavy boundary.

Bt2-33 to 45 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; moderate coarse subangular blocky structure parting to strong fine subangular blocky; hard, firm, sticky and plastic; common very fine and common medium decayed roots; many very fine, fine, medium, and coarse tubular pores; many thick clay films on faces of peds and lining pores; about 10 percent krotovinas; neutral (pH 6.9); gradual smooth boundary.

Bt3-45 to 65 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; moderate coarse subangular blocky structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; few very fine and common medium decayed roots; many very fine, fine, medium, and coarse tubular pores; many thick clay films on faces of peds and lining pores; neutral (pH 7.0); gradual smooth boundary.

Bt4-65 to 88 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few very fine and common medium decayed roots; many very fine, fine, medium, and coarse tubular pores; common thick clay films lining pores and few moderately thick clay films on faces of peds; neutral (pH 7.0); gradual smooth boundary.

C-88 to 95 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine and fine tubular pores; neutral (pH 7.1).

**Typical Pedon Location**

Map unit in which located: Greys-Robana silt loams, 1 to 4 percent slopes
Location in survey area: About 2 miles east and 1 mile north of Squirrel, about 980 feet east and 350 feet north of the southwest corner of sec. 35, T. 9 N., R. 44 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 10 to 16 inches
Depth to secondary lime: More than 60 inches
Reaction: Medium acid to neutral throughout the profile
Other features: An E horizon in some pedons in uncultivated areas

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

Bt horizon:
Value-5 or 6 dry, 4 or 5 moist
Chroma-2 to 4 dry or moist
Texture-silt loam, silty clay loam
Content of clay-18 to 35 percent
Content of rock fragments-0 to 1 percent

### Taxadjunct Features

The Greys soils in this survey area do not have an albic horizon and are classified as fine-silty, mixed Argic Cryoborolls. These differences, however, do not significantly affect the use and management of the soils.

## Hagenbarth Series

Depth class: Deep or very deep
Drainage class: Well drained
Position on landscape: Loessal plains, canyons, foothills, basalt plains
Parent material: Loess over residuum and slope alluvium
Slope: 1 to 50 percent
Elevation: 5,200 to 6,600 feet
Average annual precipitation: 16 to 26 inches
Average annual air temperature: 36 to 41 degrees F
Frost-free period: 40 to 80 days
**Taxonomic class:** Fine-loamy, mixed Argic Pachic Cryoborolls

### Typical Pedon

Oe-1.5 inches to 0; partially decomposed leaves.
A1-0 to 3 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium platy structure parting to moderate fine blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, common fine and medium, and few coarse roots; few very fine tubular pores; about 12 percent gravel; medium acid (pH 6.1); abrupt smooth boundary.
A2-3 to 14 inches; dark brown (10YR 3/3) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, common fine and medium, and few coarse roots; few very fine tubular pores; about 10 percent gravel; slightly acid (pH 6.2); abrupt smooth boundary.
Bt1-14 to 23 inches; brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; strong coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium and few coarse roots; many very fine, common fine, and few medium tubular pores; few thin clay films on faces of peds; about 20 percent gravel; neutral (pH 6.8); gradual smooth boundary.
Bt2-23 to 35 inches; brown (7.5YR 4/2) gravelly loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and few fine, medium, and coarse roots; many very fine and common fine tubular pores; few thin clay films on faces of peds; about 25 percent gravel; neutral (pH 6.8); abrupt smooth boundary.
2Bt3-35 to 48 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; moderate coarse prismatic structure; very hard, very firm, very sticky and plastic; common very fine and few fine, medium, and coarse roots; many very fine and few fine tubular pores; many thin clay films on faces of peds; about 10 percent gravel; neutral (pH 6.6); gradual wavy boundary.
2C-48 to 62 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 5/4) moist; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots; common fine tubular pores; about 5 percent gravel; slightly acid (pH 6.4).

### Typical Pedon Location

Map unit in which located: Hagenbarth, loamy surface Vadnais-Katseanes loams, 20 to 50 percent slopes
Location in survey area: About 7 miles west and 8 miles north of Ashton, about 2,300 feet south and 1,900 feet east of the northwest corner of sec. 14, T. 10 N., R. 41 E.

### Range in Characteristics

Depth to gravelly material: 7 to 18 inches
Thickness of the mollic epipedon: 17 to 38 inches
Content of clay in the particle-size control section: 18 to 29 percent
Other features: No 0 horizon in some pedons

A horizon:
Value-3 to 5 dry, 2 or 3 moist
Chroma-1 to 3 dry or moist
Content of rock fragments-0 to 15 percent
Reaction-medium acid to neutral

Bt horizon:
Hue-5YR to 10YR
Value-3 to 6 dry, 3 or 4 moist
Chroma-2 to 4 dry or moist
Texture-silt loam, silty clay loam, sandy clay loam,

loam, gravelly loam, clay loam
Reaction-medium acid to neutral

2C horizon:
Texture-loamy sand, clay

**Haploxerolls**

Depth class: Shallow to very deep
Drainage class: Well drained
Position on landscape: Canyonsides, ravines
Parent material: Side slope alluvium, colluvium, loess
Slope: 35 to 60 percent
Elevation: 5,000 to 6,000 feet
Average annual precipitation: 15 to 18 inches
Average annual air temperature: 40 to 43 degrees F
Frost-free period: 50 to 90 days

**Reference Pedon**

A-0 to 10 inches; variable texture and color.
B-10 to 50 inches; grayish brown (10YR 5/2) very gravelly sandy loam, dark brown (10YR 3/3) moist; single grain; few roots; few pores; alkaline.
R-unweathered bedrock.

**Reference Pedon Location**

Map unit in which located: Cryoborolls-Haploxerolls Rock outcrop association, very steep
Location in survey area: About 8 miles east and 3 miles north of Ashton; T. 48 N., R. 44 E.

**Range in Characteristics**

Depth to bedrock: 10 to more than 60 inches
Thickness of the mollic epipedon: 10 to 20 inches

**Henryslake Series**

Depth class: Very deep
Drainage class: Poorly drained
Position on landscape: Outwash plains
Parent material: Alluvium
Slope: 0 to 4 percent
Elevation: 6,300 to 6,525 feet
Average annual precipitation: 25 to 30 inches
Average annual air temperature: 36 to 40 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Loamy-skeletal, mixed Argic Cryaquolls

**Typical Pedon**

A-0 to 3 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; common fine distinct yellowish red (5YR 5/6 moist) mottles; massive; slightly hard, friable, sticky and plastic; few fine and many very fine roots; about 20 percent gravel and 5 percent basalt cobbles; mildly alkaline (pH 7.6); clear smooth boundary.
Bt1-3 to 10 inches; grayish brown (10YR 5/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; common medium prominent dark reddish brown (5YR 3/3 moist) mottles; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and few fine roots; many fine tubular pores; common moderately thick clay films on faces of peds; about 25 percent gravel and 5 percent cobbles; mildly alkaline (pH 7.7) gradual wavy boundary.
Bt2-10 to 23 inches; grayish brown (10YR 5/2) very gravelly clay loam, dark brown (10YR 4/3) moist; common medium prominent dark reddish brown (5YR 3/3 moist) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; few thin clay films lining pores; about 35 percent gravel and 5 percent cobbles; mildly alkaline (pH 7.7); gradual wavy boundary.
2C-23 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly loam, dark yellowish brown (10YR 4/4) moist; many large distinct dark brown (7.5YR 4/4 moist) mottles; single grain; loose; few very fine roots; about 65 percent gravel and 5 percent cobbles; mildly alkaline (pH 7.7).

**Typical Pedon Location**

Map unit in which located: Henryslake gravelly loam, 0 to 4 percent slopes
Location in survey area: About 11 miles west of Island Park Dam, about 650 feet west and 700 feet north of the southeast corner of sec. 22, T. 13 N., R. 41 E.

**Range in Characteristics**

Seasonal high water table: 12 inches above to 24 inches below the surface

Particle-size control section:
Content of clay-25 to 34 percent
Content of gravel-30 to 50 percent
Content of cobbles-5 to 10 percent

A horizon:
Value-4 or 5 dry, 2 or 3 moist

Bt horizon:
Value-5 or 6 dry, 3 or 4 moist
Chroma-2 to 4 dry or moist
Texture-gravelly clay loam, very gravelly clay loam, very gravelly loam

2C horizon:
Value-5 or 6 dry
Texture-extremely gravelly loam, very gravelly loam
Content of clay-18 to 27 percent

**Jipper Series**

Depth class: Deep or very deep
Drainage class: Well drained
Position on landscape: Basalt plains, rhyolite plains
Parent material: Eolian deposits
Slope: 1 to 8 percent
Elevation: 5,000 to 5,620 feet
Average annual precipitation: 13 to 16 inches
Average annual air temperature: 37 to 42 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Coarse-loamy, mixed, frigid Calcic Pachic Haploxerolls

**Typical Pedon**

A1-0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark brown (10YR 2/2) moist; massive; slightly hard, very friable; mildly alkaline (pH 7.7); clear smooth boundary.
Bw-8 to 21 inches; brown (10YR 5/3) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky; 3 percent gravel; mildly alkaline (pH 7.6); clear smooth boundary.
Bk-21 to 45 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; weak medium and coarse subangular blocky structure; soft, friable, slightly sticky; slightly effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary.
2R-45 inches; unweathered vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Jipper-Nayrib-Stipe complex, 1 to 8 percent slopes
Location in survey area: About 7 miles north and 3 miles west of Parker, about 1,700 feet north and 1,700 feet east of the southwest corner of sec. 36, T. 9 N., R. 39 E.

**Range in Characteristics**

Depth to bedrock: 40 to more than 60 inches
Thickness of the mollic epipedon: 20 to 49 inches
Content of rock fragments in the particle-size control section: 0 to 10 percent

A horizon:
Value-3 to 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Reaction-neutral or mildly alkaline

Bw horizon:
Value-3 to 5 dry, 2 to 4 moist
Chroma-2 to 4 dry or moist
Texture-fine sandy loam, very fine sandy loam, loam

Bk horizon.
Value-6 to 8 dry, 4 to 6 moist
Chroma-2 to 4 dry or moist
Texture-fine sandy loam, very fine sandy loam, loam, gravelly fine sandy loam, loamy sand, gravelly loamy sand, sandy clay loam, gravelly loamy fine sand
Calcium carbonate equivalent-5 to 15 percent

**Judkins Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Mountainsides, terraces
Parent material: Residuum and slope alluvium derived from rhyolite and related igneous rocks
Slope: 1 to 30 percent
Elevation: 5,500 to 6,700 feet
Average annual precipitation: 25 to 30 inches
Average annual air temperature: 34 to 38 degrees F
Frost-free period: 30 to 70 days
**Taxonomic class:** Loamy-skeletal, mixed Mollic Cryoboralfs

**Typical Pedon**

Oi-6 to 4 inches; slightly decomposed conifer needles and twigs.
Oe-4 inches to 0; partially decomposed duff.
A-0 to 1 inch; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly plastic; slightly acid (pH 6.1); abrupt wavy boundary.
E-1 to 5 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly plastic; 25 percent gravel; slightly acid (pH 6.3); clear wavy boundary.
E/B-5 to 8 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, slightly plastic; 30 to 35 percent gravel; slightly acid (pH 6.3); clear wavy boundary.
Bt-8 to 36 inches; light brownish gray (10YR 6/2) extremely stony clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky

structure; hard, firm, sticky and plastic; common thin clay films on faces of peds; about 65 percent stones; slightly acid (pH 6.4); abrupt wavy boundary.

R-36 inches; fractured rhyolitic tuff.

**Typical Pedon Location**

Map unit in which located: Judkins gravelly loam, 1 to 15 percent slopes
Location in survey area: About 1 mile west and 5 miles north of the western edge of the Island Park Reservoir, about 180 feet south and 800 feet west of the northeast corner of sec. 15, T. 13 N., R. 41 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Content of rock fragments in the particle-size control section: 45 to 90 percent
Depth to the petrocalcic horizon: 15 to 30 inches
A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
E horizon:
Value-4 to 7 dry or moist
Chroma-2 or 3 dry or moist
Reaction-medium acid or slightly acid
E/B horizon:
Value-4 to 6 dry or moist
Chroma-2 or 3 dry or moist
Reaction-medium acid or slightly acid
Content of rock fragments-35 to 50 percent
Bt horizon:
Value-3 to 6 dry or moist
Chroma-2 to 4 dry or moist
Content of clay-25 to 35 percent
Reaction-medium acid or slightly acid
Texture-extremely stony clay loam, very stony loam, extremely stony loam

**Juniperbute Series**

Depth class: Very deep
Drainage class: Excessively drained
Position on landscape: Stabilized dunes, basalt plains
Parent material: Eolian deposits Slope: 1 to 30 percent
Elevation: 5,250 to 6,100 feet
Average annual precipitation: 12 to 16 inches
Average annual air temperature: 39 to 43 degrees F
Frost-free period: 75 to 95 days
Taxonomic class: Mixed, frigid Typic Xeropsamments

**Typical Pedon**

A-0 to 4 inches; brown (10YR 4/3) fine sand, dark brown (10YR 3/3) moist; single grain; loose; many very fine roots; 0.72 percent organic carbon; neutral (pH 7.2); gradual smooth boundary.
C-4 to 60 inches; brown (10YR 4/3) fine sand, dark brown (10YR 3/3) moist; single grain; loose; common very fine roots; 0.30 percent organic carbon; mildly alkaline (pH 7.5).

**Typical Pedon Location**

Map unit in which located: Juniperbute fine sand, 2 to 30 percent slopes
Location in survey area: About 11 miles west and 5 miles north of St. Anthony, about 530 feet west and 2,640 feet north of the southeast corner of sec. 18, T. 8 N., R. 39 E.

**Range in Characteristics**

Content of clay in the particle-size control section: 2 to 5 percent
A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-1 to 3 dry or moist
C horizon:
Value-4 to 6 dry, 3 or 4 moist
Chroma-2 to 4 dry or moist
Texture-fine sand, sand

**Katseanes Series**

Depth class: Shallow
Drainage class: Well drained
Position on landscape: Basalt plains, side slopes in dissected calderas
Parent material: Valley side alluvium derived from mixed eolian deposits
Slope: 1 to 50 percent
Elevation: 5,000 to 6,600 feet
Average annual precipitation: 18 to 26 inches
Average annual air temperature: 37 to 41 degrees F
Frost-free period: 40 to 80 days
Taxonomic class: Loamy, mixed Argic Lithic Cryoborolls

**Typical Pedon**

A1-0 to 3 inches; brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; 5 percent basalt gravel; medium acid (pH 5.6); gradual wavy boundary.

A2-3 to 7 inches; brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; 5 percent gravel; strongly acid (pH 5.5); gradual wavy boundary.

Bt1-7 to 13 inches; brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent basalt gravel; medium acid (pH 5.7); clear wavy boundary.

Bt2-13 to 17 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; moderate medium and fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine tubular pores; common moderately thick clay films on faces of peds and lining pores; 10 percent basalt cobbles; medium acid (pH 5.7); abrupt wavy boundary.

2R-17 inches; vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Katseanes-Rock outcrop-Vadnais complex, 1 to 12 percent slopes

Location in survey area: About 1 mile west and 17 miles north of St. Anthony, about 1,720 feet west and 800 feet south of the northeast corner of sec. 11, T. 10 N., R. 40 E.

**Range in Characteristics**

Depth to bedrock: 10 to 20 inches

Thickness of the mollic epipedon: 10 to 13 inches

A horizon:

Value-3 to 5 dry

Chroma-2 or 3 dry or moist

Bt horizon:

Value-4 or 5 dry, 3 or 4 moist

Chroma-2 to 4 dry or moist

Content of rock fragments-0 to 15 percent

Content of clay-19 to 27 percent

Reaction-medium acid to mildly alkaline

**Kitchell Series**

Depth class: Very deep

Drainage class: Well drained

Position on landscape: Mountainsides

Parent material: Slope alluvium and residuum derived from limestone

Slope: 15 to 55 percent

Elevation: 6,800 to 8,200 feet

Average annual precipitation: 16 to 26 inches

Average annual air temperature: 38 to 40 degrees F

Frost-free period: 45 to 55 days

**Taxonomic class:** Loamy-skeletal, carbonatic Calcic Pachic Cryoborolls

**Typical Pedon**

Oi-2 inches to 0; undecomposed needles, leaves, and twigs.

A-0 to 7 inches; dark brown (10YR 3/3) gravelly loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate medium granular; hard, firm, slightly sticky and slightly plastic; few very fine discontinuous and oblique pores; common very fine, fine, and medium roots; about 20 percent gravel; mildly alkaline (pH 7.4); gradual wavy boundary.

Bk1-7 to 12 inches; dark brown (10YR 4/3) cobbly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine discontinuous and oblique pores; common very fine, fine, and medium roots; very few thin clay films; about 15 percent gravel and 10 percent cobbles; strongly effervescent; mildly alkaline (pH 7.7); gradual wavy boundary.

Bk2-12 to 18 inches; dark brown (10YR 4/3) very cobbly loam, dark brown (10YR 3/3) moist; weak medium and fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine discontinuous and oblique pores; about 15 percent gravel and 20 percent cobbles; violently effervescent; mildly alkaline (pH 7.7); clear wavy boundary.

Bk3-18 to 26 inches; brown (10YR 5/3) very cobbly loam, yellowish brown (10YR 5/4) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine discontinuous and oblique pores; about 20 percent cobbles; violently effervescent; mildly alkaline (pH 7.7); clear wavy boundary.

Bk4-26 to 36 inches; very pale brown (10YR 7/3) extremely cobbly loam, yellowish brown (10YR 5/4) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; about 35 percent gravel and 35 percent cobbles; violently effervescent; mildly alkaline (pH 7.8); clear wavy boundary.

Bk5-36 to 60 inches; pale yellow (5Y 7/3) extremely cobbly loam, olive (5Y 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; about 35 percent gravel and 45 percent cobbles; violently effervescent; moderately alkaline (pH 8.0).

**Typical Pedon Location**

Map unit in which located: Kitchell gravelly loam, 15 to 55 percent slopes
Location in survey area: About 1 mile south of the junction of State Highway 87 and U.S. Highway 20, about 1,250 feet north and 1,320 feet west of the southeast corner of sec. 13, T. 15 N., R. 43 E.

**Range in Characteristics**

Thickness of the solum: More than 60 inches
Thickness of the mollic epipedon: 16 to 30 inches
Depth to the calcic horizon: 0 to 9 inches

Particle-size control section:
Calcium carbonate equivalent-42 to 62 percent
Content of clay-10 to 25 percent
Content of gravel-18 to 27 percent
Content of cobbles-20 to 29 percent
Content of stones-0 to 10 percent

A horizon:
Hue-10YR or 7.5YR
Value-3 to 5 dry, 2 or 3 moist
Chroma-2 or 3

Bk horizon:
Hue-10YR to 5Y
Value-3 to 8 dry, 4 to 8 moist
Chroma-1 to 4 dry or moist
Texture-cobbly loam, extremely cobbly loam, extremely stony loam, very gravelly loam

**Classification Features**

Kitchell gravelly loam, 15 to 55 percent slopes, has colors in the Bk horizon that are outside the range defined for the series. Also, the content of clay in the control section ranges to less than 18 percent. These differences, however, do not significantly affect the use and management of the soil.

**Kucera Series**

Depth class: Deep or very deep
Drainage class: Well drained
Position on landscape: Loess-covered hillsides and basalt plains
Parent material: Loess
Slope: 0 to 12 percent
Elevation: 5,150 to 5,570 feet
Average annual precipitation: 15 to 17 inches
Average annual air temperature: 41 to 43 degrees F
Frost-free period: 80 to 95 days
**Taxonomic class:** Coarse-silty, mixed, frigid Calcic Pachic Haploxerolls

**Typical Pedon**

A-0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate thin platy structure parting to weak fine granular; slightly hard, very friable; few very fine, fine, and medium roots; few very fine and fine tubular pores; neutral (pH 6.8); clear wavy boundary.
Bw1-11 to 22 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; weak fine and very fine subangular blocky structure; slightly hard, very friable, slightly plastic; few very fine, fine, and medium roots; many very fine and fine tubular pores; neutral (pH 6.8); clear wavy boundary.
Bw2-22 to 29 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; many very fine and fine tubular pores; neutral (pH 6.8); clear wavy boundary.
Bw3-29 to 41 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; many very fine and fine tubular pores; neutral (pH 7.0); clear wavy boundary.
Bk-41 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine tubular pores; violently effervescent; mildly alkaline (pH 7.6).

**Typical Pedon Location**

Map unit in which located: Kucera-Sarilda silt loams, 2 to 6 percent slopes
Location in survey area: About 3 miles south of Ashton, about 1,420 feet west and 50 feet north of the southeast corner of sec. 11, T. 8 N., R. 42 E.

**Range in Characteristics**

Depth to bedrock: 40 inches or more
Thickness of the mollic epipedon: 20 to 43 inches
Depth to the calcic horizon: 20 to 43 inches

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

Bw horizon:
Value-4 or 5 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist
Reaction-neutral to moderately alkaline

Bk horizon:
Value-6 or 7 dry, 5 or 6 moist
Reaction-mildly alkaline or moderately alkaline

**Labenzo Series**

Depth class: Very deep
Drainage class: Moderately well drained
Position on landscape: Stream terraces
Parent material: Alluvium
Slope: 0 to 1 percent
Elevation: 4,900 to 5,000 feet
Average annual precipitation: 10 to 13 inches
Average annual air temperature: 41 to 44 degrees F
Frost-free period: 85 to 95 days
**Taxonomic class:** Fine-loamy over sandy or sandy skeletal, mixed, frigid Fluventic Haploxerolls

**Typical Pedon**

A1-0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and many very fine roots; many very fine and fine tubular pores; strongly effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

A2-8 to 12 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine and fine tubular pores; strongly effervescent; moderately alkaline (pH 7.9); abrupt wavy boundary.

C1-12 to 18 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; few fine faint brown (10YR 4/3 moist) mottles; massive; hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine tubular pores; strongly effervescent; common fine irregularly shaped soft masses of lime; mildly alkaline (pH 7.6); gradual smooth boundary.

C2-18 to 24 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; few fine distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; slightly effervescent; mildly alkaline (pH 7.6); gradual smooth boundary.

**Figure 9.-Profile of Labenzo silt loam, 0 to 1 percent slopes.**

C3-24 to 27 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; few medium distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; slightly hard, very friable; few very fine roots; common very fine tubular pores; slightly effervescent; mildly alkaline (pH 7.6); abrupt wavy boundary.

2C4-27 to 60 inches; grayish brown (10YR 5/2) extremely gravelly sand, dark brown (10YR 3/3) moist; single grain; loose; many fine and very fine interstitial pores; 85 percent gravel; slightly effervescent; mildly alkaline (pH 7.6).

**Typical Pedon Location**

Map unit in which located: Labenzo silt loam, 0 to 1 percent slopes (fig. 9)
Location in survey area: About 1.5 miles north of Teton, about 1,320 feet north and 500 feet west of the

southeast corner of sec. 25, T. 7 N., R. 40 E.

**Range in Characteristics**

Reaction: Mildly alkaline or moderately alkaline throughout the profile
Depth to sand and gravel: 24 to 36 inches
Depth to mottles: 9 to 35 inches

A horizon.
Value-4 or 5 dry, 3 or 4 moist
Chroma-1 or 2 dry or moist

C horizon:
Value-5 or 6 dry, 3 or 4 moist
Chroma-1 to 3 dry or moist
Texture-stratified silt loam to loamy sand

**Lantonia Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Loess-covered hillsides
Parent material: Loess
Slope: 1 to 20 percent
Elevation: 5,800 to 6,200 feet
Average annual precipitation: 15 to 18 inches
Average annual air temperature: 36 to 41 degrees F
Frost-free period: 50 to 75 days
**Taxonomic class:** Coarse-silty, mixed Pachic Cryoborolls

**Typical Pedon**

A1-0 to 8 inches; dark brown (10YR 3/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse granular structure parting to moderate very fine granular; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; neutral (pH 7.2); clear smooth boundary.

A2-8 to 18 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; strong coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine tubular pores; common very fine, fine, and medium roots; neutral (pH 7.3); clear smooth boundary.

Bw1-18 to 27 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; strong coarse and medium prismatic structure; hard, firm, slightly sticky and slightly plastic; many very fine and fine tubular pores; common very fine, fine, and medium roots; many thin clay films lining pores and common thin clay films on faces of peds; mildly alkaline (pH 7.4); clear wavy boundary.

Bw2-27 to 34 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to strong medium prismatic; hard, firm, slightly sticky and slightly plastic; many very fine, fine, and medium tubular pores; common very fine, fine, and medium roots; few moderately thick clay films on faces of peds and lining pores; mildly alkaline (pH 7.4); gradual wavy boundary.

Bw3-34 to 51 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium prismatic; hard, firm, slightly sticky and slightly plastic; many very fine, fine, and medium tubular pores; common very fine and fine roots; few moderately thick clay films on faces of peds and lining pores; mildly alkaline (pH 7.4); clear wavy boundary.

Bk-51 to 60 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium tubular pores; few very fine roots; strongly effervescent; moderately alkaline (pH 8.3).

**Typical Pedon Location**

Map unit in which located: Tetonia-Lantonia silt loams, 12 to 20 percent slopes
Location in survey area: About 2 miles east of Lamont, about 2,170 feet west and 300 feet north of the southeast corner of sec. 5, T. 7 N., R. 45 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 16 to 30 inches
Depth to secondary lime: 35 to 60 inches

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-1 or 2 dry or moist
Reaction-slightly acid or neutral

Bw horizon:
Value-5 or 6 dry, 3 or 4 moist
Chroma-3 or 4 dry, 2 or 3 moist
Content of clay-12 to 18 percent (less than 3 percent more clay than in the A horizon)
Reaction-neutral or mildly alkaline

Bk horizon:
Value-6 or 7 dry, 4 to 6 moist
Chroma-2 to 4 dry or moist

**Lavacreek Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Canyonsides, hillsides
Parent material: Residuum derived from rhyolitic tuff

Slope: 6 to 45 percent
Elevation: 5,250 to 5,600 feet
Average annual precipitation: 18 to 22 inches
Average annual air temperature: 37 to 41 degrees F
Frost-free period: 55 to 70 days
**Taxonomic class:** Loamy-skeletal, mixed Andeptic Cryoborolls

**Typical Pedon**

A-0 to 11 inches; dark brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; strong medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and few medium tubular pores; about 20 percent gravel and 5 percent cobbles; slightly acid (pH 6.4); abrupt smooth boundary.

Bw1-11 to 30 inches; yellowish brown (10YR 5/4) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; many very fine and common fine and medium roots; many very fine and few fine and medium tubular pores; about 20 percent gravel, 10 percent cobbles, and 5 percent stones; neutral (pH 7.0); gradual wavy boundary.

Bw2-30 to 49 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common very fine and fine and few medium roots; few very fine and medium tubular pores; about 25 percent gravel, 15 percent cobbles, and 5 percent stones; mildly alkaline (pH 7.8); clear wavy boundary.

C-49 to 60 inches; pink (5YR 7/4) extremely gravelly sandy loam, yellowish red (5YR 5/8) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; about 35 percent gravel, 25 percent cobbles, and 10 percent stones; mildly alkaline (pH 7.8).

**Typical Pedon Location**

Map unit in which located: Lavacreek-Rin complex, 6 to 20 percent slopes

Location in survey area: About 3 miles north of Marysville, about 15 feet south and 700 feet west of the northeast corner of sec. 17, T. 9 N., R. 43 E.

**Range in Characteristics**

Thickness of the solum: 30 to 50 inches

A horizon:
- Value-4 or 5 dry
- Chroma-2 or 3 dry, 1 or 2 moist
- Content of gravel-15 to 30 percent
- Content of cobbles-0 to 5 percent
- Reaction-neutral or slightly acid

Bw horizon:
- Value-4 to 6 dry, 3 to 5 moist
- Chroma-3 to 6 dry, 2 to 4 moist
- Texture-very gravelly loam, very cobbly loam, very gravelly sandy loam
- Content of gravel-20 to 40 percent
- Content of cobbles-5 to 15 percent
- Content of stones-0 to 5 percent

C horizon:
- Hue-5YR or 7.5YR
- Value-6 to 8 dry, 5 to 7 moist
- Chroma-3 to 8 dry or moist
- Texture-extremely cobbly sandy loam, extremely gravelly loamy sand, extremely gravelly sandy loam
- Content of rock fragments-60 to 70 percent
- Reaction-neutral or mildly alkaline

**Taxadjunct Features**

The Lavacreek soils in this survey area are dominantly ashy throughout and thus are classified as ashy-skeletal Andeptic Cryoborolls. This difference, however, does not significantly affect the use and management of the soils.

**Lionhead Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Mountainsides
Parent material: Residuum derived from micaceous schist and amphibolite
Slope: 20 to 55 percent
Elevation. 6,900 to 8,540 feet
Average annual precipitation: 20 to 26 inches
Average annual air temperature: 37 to 40 degrees F
Frost-free period: 40 to 60 days
**Taxonomic class:** Loamy-skeletal, mixed Pachic Cryoborolls

**Typical Pedon**

A1-0 to 4 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; common very fine and fine vesicular pores; about 15 percent gravel; neutral (pH 6.6); clear smooth boundary.

A2-4 to 9 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable,

slightly sticky and slightly plastic; many very fine and fine and few medium roots; common very fine and fine vesicular pores; about 20 percent gravel; neutral (pH 6.8); clear smooth boundary.

Bw1-9 to 26 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; common very fine and fine vesicular pores; about 35 percent gravel and 15 percent cobbles; neutral (pH 7.2); gradual wavy boundary.

Bw2-26 to 34 inches; pale brown (10YR 6/3) very cobbly loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; common very fine vesicular pores; about 35 percent gravel and 20 percent cobbles; mildly alkaline (pH 7.6); gradual wavy boundary.

Bk1-34 to 46 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; few very fine, fine, and medium roots; about 35 percent gravel and 30 percent cobbles; few very fine soft accumulations of lime; slightly effervescent; moderately alkaline (pH 8.0); gradual wavy boundary.

Bk2-46 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly sandy loam, dark yellowish brown (10YR 4/4) moist; single grain; loose; few very fine roots; about 20 percent gravel and 60 percent cobbles; few very fine soft accumulations of lime; slightly effervescent; moderately alkaline (pH 8.2).

### Typical Pedon Location

Map unit in which located: Lionhead gravelly loam, 20 to 55 percent slopes

Location in survey area: About 2 miles north and 2 miles east of Staley Springs, about 900 feet south and 1,200 feet west of the northeast corner of sec. 29, T. 16 N., R. 43 E.

### Range in Characteristics

A horizon:

Value-3 or 4 dry, 2 or 3 moist
Chroma-1 to 3 moist
Reaction-slightly acid or neutral

Bw horizon:

Value-5 or 6 dry, 3 or 4 moist
Chroma-2 or 3 moist
Texture-very cobbly loam, extremely cobbly loam, very gravelly loam
Reaction-neutral or mildly alkaline

Bk horizon:

Value-5 or 6 dry
Chroma-3 or 4 dry or moist
Texture-extremely cobbly sandy loam, extremely cobbly loam, extremely gravelly sandy loam
Reaction-mildly alkaline or moderately alkaline

## Lostine Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Plains
Parent material: Loess
Slope: 0 to 15 percent
Elevation: 5,150 to 5,550 feet
Average annual precipitation: 15 to 18 inches
Average annual air temperature: 41 to 44 degrees F
Frost-free period: 80 to 95 days

**Taxonomic class:** Coarse-silty, mixed, frigid Pachic Haploxerolls

### Typical Pedon

Ap-0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly plastic; many very fine and fine roots; few very fine tubular pores; slightly acid (pH 6.4); clear smooth boundary.

A-9 to 20 inches; dark grayish brown (10YR 4/2) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly plastic; common very fine and fine roots; few very fine tubular pores; neutral (pH 6.8); clear wavy boundary.

Bw1-20 to 26 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly plastic; common very fine and fine roots; few very fine tubular pores; neutral (pH 7.0); clear wavy boundary.

Bw2-26 to 36 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly plastic; few very fine and fine roots; few very fine tubular pores; neutral (pH 7.0); clear wavy boundary.

C-36 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly plastic; neutral (pH 7.0).

### Typical Pedon Location

Map unit in which located: Kucera, bedrock substratum-Lostine silt loams, 1 to 6 percent slopes

Location in survey area: About 1 mile south and 1.5 miles west of Ashton, about 750 feet west and 2,480 feet south of the northeast corner of sec. 2, T. 8 N., R. 42 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 20 to 36 inches

A horizon:
Value-3 or 4 dry
Chroma-2 or 3 dry or moist
Reaction-slightly acid to mildly alkaline

Bw horizon:
Reaction-neutral or mildly alkaline

C horizon:
Value-5 or 6 dry
Chroma-2 or 3 dry or moist
Reaction-neutral or mildly alkaline

**Malm Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Eolian deposits
Slope: 0 to 12 percent
Elevation: 4,900 to 5,300 feet
Average annual precipitation: 10 to 11 inches
Average annual air temperature: 40 to 44 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Coarse-loamy, mixed, frigid Xerollic Calciorthids

**Typical Pedon**

A-0 to 6 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable; many very fine and fine roots; many very fine and fine interstitial pores; about 5 percent basalt gravel; slightly effervescent (5 percent calcium carbonate); mildly alkaline (pH 7.7); abrupt wavy boundary.

AB-6 to 15 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, very friable; many very fine and fine roots; many very fine and fine interstitial pores; about 5 percent basalt gravel; slightly effervescent (5 percent calcium carbonate); mildly alkaline (pH 7.8); clear wavy boundary.

Bk1-15 to 25 inches; pale brown (10YR 6/3) fine sandy loam, grayish brown (10YR 5/2) moist; weak thick platy structure; slightly hard, very friable; common very fine and fine roots; common very fine and fine tubular pores; about 5 percent basalt gravel; strongly effervescent (7 percent calcium carbonate); moderately alkaline (pH 8.0); clear wavy boundary.

Bk2-25 to 36 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; massive; hard, friable; few fine roots; common fine tubular pores; about 5 percent basalt gravel; violently effervescent (20 percent calcium carbonate); moderately alkaline (pH 8.4); abrupt wavy boundary

2R-36 inches; vesicular basalt; thin coatings of lime on surface and in pores and cracks.

**Typical Pedon Location**

Map unit in which located: Malm-Rock outcrop complex, 0 to 12 percent slopes
Location in survey area: About 17 miles west and 7 miles north of Parker, about 500 feet north and 2,000 feet east pf the southwest corner of sec. 4, T. 8 N., R. 37 E. /

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Depth to the calcic horizon: 10 to 20 inches
Reaction: Mildly alkaline to strongly alkaline throughout the profile

A and AB horizons:
Value-5 to 7 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist

Bk horizon:
Value-6 or 7 dry, 4 to 6 moist
Chroma-2 or 3 dry or moist
Calcium carbonate equivalent-7 to 28 percent
Maximum calcium carbonate equivalent-20 to 28 percent

**Marotz Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Plains
Parent material: Glacial drift and some loess
Slope: 1 to 20 percent
Elevation: 5,200 to 5,800 feet
Average annual precipitation: 16 to 20 inches
Average annual air temperature: 39 to 43 degrees F
Frost-free period: 70 to 90 days
**Taxonomic class:** Fine-loamy, mixed, frigid Pachic Argixerolls

**Typical Pedon**

A-0 to 16 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly

plastic; many very fine and fine roots; many very fine tubular pores; about 10 percent gravel; neutral (pH 7.0); clear smooth boundary.

Bw-16 to 27 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common fine pores; about 10 percent gravel; neutral (pH 7.2); clear smooth boundary.

Btb1-27 to 38 inches; yellowish brown (10YR 5/4) gravelly silt loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; about 15 percent gravel; few thin clay films on faces of peds; neutral (pH 7.2); gradual wavy boundary.

Btb2-38 to 49 inches; yellowish brown (10YR 5/4) gravelly silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, sticky and plastic; few very fine roots; common very fine tubular pores; about 20 percent gravel; common moderately thick clay films on faces of peds; clay nodules; mildly alkaline (pH 7.4); gradual wavy boundary.

Btb3-49 to 60 inches; yellowish brown (10YR 5/4) gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; common very fine tubular pores; about 28 percent gravel; few thin clay films on faces of peds; clay nodules; uncoated silt grains on faces of peds; mildly alkaline (pH 7.4).

### Typical Pedon Location

Map unit in which located: Marotz silt loam, 1 to 4 percent slopes

Location in survey area: About 1 mile east and 3 miles north of Marysville, about 1,800 feet west and 1,700 feet south of the northeast corner of sec. 22, T. 9 N., R. 43 E.

### Range in Characteristics

Thickness of the mollic epipedon: 25 to 60 inches

Particle-size control section:
- Content of clay-25 to 35 percent
- Content of coarse fragments (mostly gravel)-15 to 35 percent

A horizon:
- Value-3 or 4 dry
- Chroma-2 or 3 dry or moist

Bw horizon:
- Value-4 or 5 dry
- Chroma-2 or 3 dry or moist
- Texture-silt loam, silty clay loam, sandy clay loam
- Reaction-neutral or mildly alkaline

Btb horizon:
- Hue-10YR or 7.5YR
- Value-4 or 5 dry, 3 or 4 moist
- Chroma-3 or 4 dry or moist
- Texture-gravelly silty clay loam, gravelly clay loam, very gravelly silty clay loam, gravelly silt loam
- Reaction-neutral or mildly alkaline

## Marystown Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Plains, moraines
Parent material: Glacial drift and some loess
Slope: 1 to 20 percent
Elevation: 5,300 to 5,700 feet
Average annual precipitation: 16 to 22 inches
Average annual air temperature: 39 to 43 degrees F
Frost-free period: 75 to 85 days
**Taxonomic class:** Fine-silty, mixed, frigid Pachic Argixerolls

### Typical Pedon

Ap-0 to 12 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; about 2 percent gravel; neutral (pH 7.2); clear smooth boundary.

BA-12 to 21 inches; dark brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine tubular pores; about 2 percent gravel; neutral (pH 7.2); clear wavy boundary.

Bt-21 to 31 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; uncoated silt grains on faces of peds; few thin clay films on faces of peds; mildly alkaline (pH 7.4); gradual wavy boundary.

Btb1-31 to 40 inches; yellowish brown (10YR 5/4) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and

plastic; few very fine roots; few very fine tubular pores; about 2 percent gravel; uncoated silt grains on faces of peds; common moderately thick clay films on faces of peds; clay nodules; mildly alkaline (pH 7.4); clear wavy boundary.

Btb2-40 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; about 5 percent gravel; few thin clay films on faces of peds; mildly alkaline (pH 7.5).

**Typical Pedon Location**

Map unit in which located: Marystown silt loam, 1 to 4 percent slopes

Location in survey area: About 6 miles east and 2 miles north of Marysville, about 500 feet west and 75 feet south of the northeast corner of sec. 19, T. 9 N., R. 44 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 20 to 40 inches

Reaction: Neutral or mildly alkaline throughout the profile

Particle-size control section:
- Content of clay-18 to 35 percent
- Content of rock fragments-0 to 10 percent

Ap and BA horizons:
- Value-4 or 5 dry, 2 or 3 moist
- Chroma-2 or 3 dry or moist

Bt horizon:
- Value-4 or 5 dry, 3 or 4 moist
- Chroma-3 or 4 dry or moist
- Texture-silt loam, silty clay loam

Btb1 horizon:
- Value-4 or 5 dry, 3 or 4 moist
- Chroma-3 or 4 dry or moist
- Texture-silt loam, silty clay loam

Btb2 horizon:
- Hue-7.5YR or 10YR
- Value-5 to 7 dry, 4 or 5 moist
- Chroma-3 or 4 dry or moist
- Content of clay-20 to 35 percent
- Texture-silt loam, silty clay loam, gravelly silty clay loam

**Modkin Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Eolian deposits
Slope: 1 to 20 percent
Elevation: 4,920 to 5,100 feet
Average annual precipitation: 10 to 11 inches
Average annual air temperature: 41 to 44 degrees F
Frost-free period: 85 to 100 days

**Taxonomic class:** Coarse-loamy, mixed, frigid Xerollic Camborthids

**Typical Pedon**

Ap-0 to 5 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; weak thin platy structure; soft, very friable; many very fine and fine roots; many very fine and fine interstitial pores; mildly alkaline (pH 7.8); clear wavy boundary.

Bw-5 to 13 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; common very fine and fine roots; many very fine and fine interstitial pores; mildly alkaline (pH 7.8); clear smooth boundary.

Bk1-13 to 24 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, friable; common very fine and fine roots; many very fine and fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.0); gradual smooth boundary.

Bk2-24 to 36 inches; very pale brown (10YR 8/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; hard, friable; few very fine and fine roots; common very fine and fine tubular pores; 5 percent angular gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary.

R-36 inches; unweathered, lime-coated vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Modkin loamy sand, 4 to 20 percent slopes

Location in survey area: About 15 miles west and 2 miles north of Parker, about 2 feet south and 2 feet east of the northwest corner of sec. 34, T. 8 N., R. 37 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Depth to lime: 7 to 35 inches

Particle-size control section:
- Content of clay-8 to 12 percent
- Content of rock fragments-0 to 5 percent
- Reaction-neutral to moderately alkaline

A horizon:
- Value-5 or 6 dry
- Chroma-2 or 3 dry or moist

Bw horizon:
Value-5 or 6 dry, 3 or 4 moist
Chroma-2 or 3 dry or moist
Texture-sandy loam, fine sandy loam

Bk horizon.
Value-5 to 8 dry, 4 to 7 moist
Chroma-2 or 3 dry or moist
Texture-sandy loam, fine sandy loam

**Nayrib Series**

Depth class: Very shallow
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Eolian deposits, residuum
Slope: 1 to 8 percent
Elevation: 5,000 to 5,500 feet
Average annual precipitation: 12 to 17 inches
Average annual air temperature: 41 to 43 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Loamy-skeletal, mixed, frigid Lithic Haploxerolls

**Typical Pedon**

A1-0 to 4 inches; brown (10YR 5/3) very cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; about 7 percent stones, 15 percent cobbles, and 20 percent gravel; neutral (pH 7.0); gradual smooth boundary.
A2-4 to 8 inches; brown (10YR 5/3) very cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; 5 percent stones, 15 percent cobbles, and 20 percent gravel; neutral (pH 7.2); abrupt wavy boundary.
R-8 inches; unweathered vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Jipper-Nayrib-Stipe complex, 1 to 8 percent slopes
Location in survey area: About 8 miles north and 9 miles west of Parker, about 2,170 feet east and 100 feet south of the northwest corner of sec. 26, T. 9 N., R. 38 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 6 to 10 inches

Particle-size control section:
Content of rock fragments-35 to 80 percent
Content of clay-12 to 18 percent

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

**Pinebutte Series**

Depth class: Deep
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Loess, slope alluvium
Slope: 1 to 12 percent
Elevation: 5,800 to 6,400 feet
Average annual precipitation: 15 to 20 inches
Average annual air temperature: 38 to 42 degrees F
Frost-free period: 40 to 80 days
**Taxonomic class:** Fine-silty, mixed Argic Pachic Cryoborolls

**Typical Pedon**

A1-0 to 3 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; common very fine tubular pores; medium acid (pH 5.7); clear wavy boundary.
A2-3 to 7 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; slightly acid (pH 6.2); clear wavy boundary.
Bt1-7 to 11 inches; dark brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; very few thin clay films lining pores; slightly acid (pH 6.4); clear wavy boundary.
Bt2-11 to 19 inches; yellowish brown (10YR 5/4) silty clay loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few very fine and fine roots; common very fine tubular pores; common thick clay films lining pores and on faces of peds; uncoated silt grains; neutral (pH 6.6); gradual wavy boundary.
Bt3-19 to 35 inches; yellowish brown (10YR 5/4) silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate

coarse and medium subangular blocky; hard, firm, sticky and plastic; few fine and very fine roots; common very fine tubular pores; common thick clay films lining pores and on faces of peds; uncoated silt grains; neutral (pH 6.9); gradual wavy boundary.

Bt4-35 to 41 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; few moderately thick clay films on faces of peds and few thick clay films lining pores; neutral (pH 7.2); abrupt wavy boundary.

Bk1-41 to 46 inches; white (10YR 8/1) silt loam, pale brown (10YR 6/3) moist; massive; friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; violently effervescent; moderately alkaline (pH 7.9); clear wavy boundary.

Bk2-46 to 48 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; massive; friable, slightly sticky and slightly plastic; few very fine roots; violently effervescent; moderately alkaline (pH 7.8); abrupt smooth boundary.

2R-48 inches; vesicular basalt.

### Typical Pedon Location

Map unit in which located: Hagenbarth-Pinebutte Katseanes silt loams, 1 to 12 percent slopes

Location in survey area: About 15 miles north of Parker, about 1,800 feet west and 260 feet south of the northeast corner of sec. 27, T. 10 N., R. 40 E.

### Range in Characteristics

Depth to bedrock: 40 to 60 inches
Depth to secondary lime: 29 to 40 inches
Thickness of the mollic epipedon: 16 to 26 inches

A horizon:
- Value-3 or 4 dry
- Chroma-1 to 3 dry or moist
- Reaction-medium acid to neutral

Bt horizon:
- Value-4 to 6 dry, 3 to 5 moist
- Chroma-2 or 3 dry or moist
- Texture-silt loam, silty clay loam
- Reaction-slightly acid to mildly alkaline

Bk horizon:
- Hue-2.5Y or 10YR
- Value-6 to 8 dry, 5 or 6 moist
- Chroma-2 to 4 dry or moist
- Calcium carbonate equivalent-15 to 35 percent

## Povey Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Draws, mountainsides, and ridgetops on plains
Parent material: Residuum, side slope alluvium, and colluvium derived from rhyolite
Slope: 5 to 45 percent
Elevation. 5,780 to 6,450 feet
Average annual precipitation: 17 to 22 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 45 to 65 days
**Taxonomic class:** Loamy-skeletal, mixed Pachic Cryoborolls

### Typical Pedon

A1-0 to 6 inches; dark brown (10YR 3/3) very gravelly loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly plastic; many very fine and fine and few medium and coarse roots; many very fine interstitial pores; about 25 percent gravel, 5 percent cobbles, and 1 percent stones; slightly acid (pH 6.1); gradual smooth boundary.

A2-6 to 11 inches; dark brown (10YR 3/3) very gravelly loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; common fine tubular pores; 40 percent gravel, 5 percent cobbles, and 1 percent stones; slightly acid (pH 6.1); gradual smooth boundary.

Bw1-11 to 19 inches; brown (10YR 5/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to strong fine granular; hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; 50 percent gravel, 5 percent cobbles, and 2 percent stones; slightly acid (pH 6.1); clear smooth boundary.

Bw2-19 to 43 inches; brown (10YR 5/3) extremely gravelly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to weak fine granular; hard, very friable, sticky and plastic; few fine roots; few fine tubular pores; 70 percent gravel, 5 percent cobbles, and 1 percent stones; slightly acid (pH 6.4); gradual smooth boundary.

C-43 to 60 inches; brown (10YR 5/3) extremely gravelly loam, dark brown (10YR 3/3) moist; massive; loose; few fine roots; many fine interstitial

pores; 50 percent gravel, 20 percent cobbles, and 2 percent stones; slightly acid (pH 6.4).

### Typical Pedon Location

Map unit in which located: Povey-Splitbutte-Rock outcrop complex, 5 to 20 percent slopes
Location in survey area: About 2 miles north of the Sandcreek Reservoir, about 2,850 feet east and 1,650 feet north of the southwest corner of sec. 33, T. 11 N., R. 41 E.

### Range in Characteristics

Thickness of the mollic epipedon: 19 to 44 inches
Reaction: Slightly acid or neutral throughout the profile
Content of clay in the particle-size control section: 10 to 18 percent

A horizon:
Value-3 to 5 dry, 2 or 3 moist
Chroma-1 to 3

Bw horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-1 to 3

C horizon:
Value-4 or 5 dry, 3 or 4 moist
Chroma-2 to 4
Texture-extremely stony loam, extremely gravelly loam

## Raynoldson Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Fan terraces, outwash plains
Parent material: Gravelly alluvium
Slope: 2 to 15 percent
Elevation: 6,500 to 6,900 feet
Average annual precipitation: 18 to 24 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Loamy-skeletal, mixed Calcic Pachic Cryoborolls

### Typical Pedon

A1-0 to 6 inches; dark yellowish brown (10YR 4/4) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; common very fine and fine and few medium tubular pores; about 25 percent gravel; moderately alkaline (pH 7.9); gradual smooth boundary.

A2-6 to 12 inches; dark yellowish brown (10YR 4/4) gravelly loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; many very fine and few medium tubular pores; about 30 percent gravel; moderately alkaline (pH 7.9); clear smooth boundary.

Bw-12 to 18 inches; dark yellowish brown (10YR 4/4) very gravelly loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; common very fine and fine tubular pores; about 40 percent gravel and 5 percent cobbles; moderately alkaline (pH 7.9); gradual smooth boundary.

2Bk1-18 to 32 inches; variegated, dominantly dark yellowish brown (10YR 4/4) extremely gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; single grain; loose; many very fine and few medium roots; about 50 percent gravel and 15 percent cobbles; violently effervescent; moderately alkaline (pH 8.1); gradual smooth boundary.

2Bk2-32 to 60 inches; variegated, dominantly dark yellowish brown (10YR 4/4) extremely gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; single grain; loose; many very fine and fine roots; about 45 percent gravel and 20 percent cobbles; violently effervescent; 1-millimeter-thick coatings of calcium carbonate on rock fragments; moderately alkaline.

### Typical Pedon Location

Map unit in which located: Raynoldson gravelly loam, 2 to 15 percent slopes (fig. 10)
Location in survey area: About 1 mile north of Island Park Airport, about 2,600 feet west and 1,100 feet south of the northeast corner of sec. 11, T. 15 N., R. 43 E.

### Range in Characteristics

Depth to lime: 16 to 30 inches
Average content of clay in the particle-size control section: 4 to 12 percent

A horizon.
Value-3 or 4 dry, 2 or 3 moist
Chroma-1 to 3 moist
Reaction-neutral to moderately alkaline

Bw horizon:
Value-4 to 6 dry, 2 or 3 moist
Chroma-2 to 4 dry, 2 or 3 moist

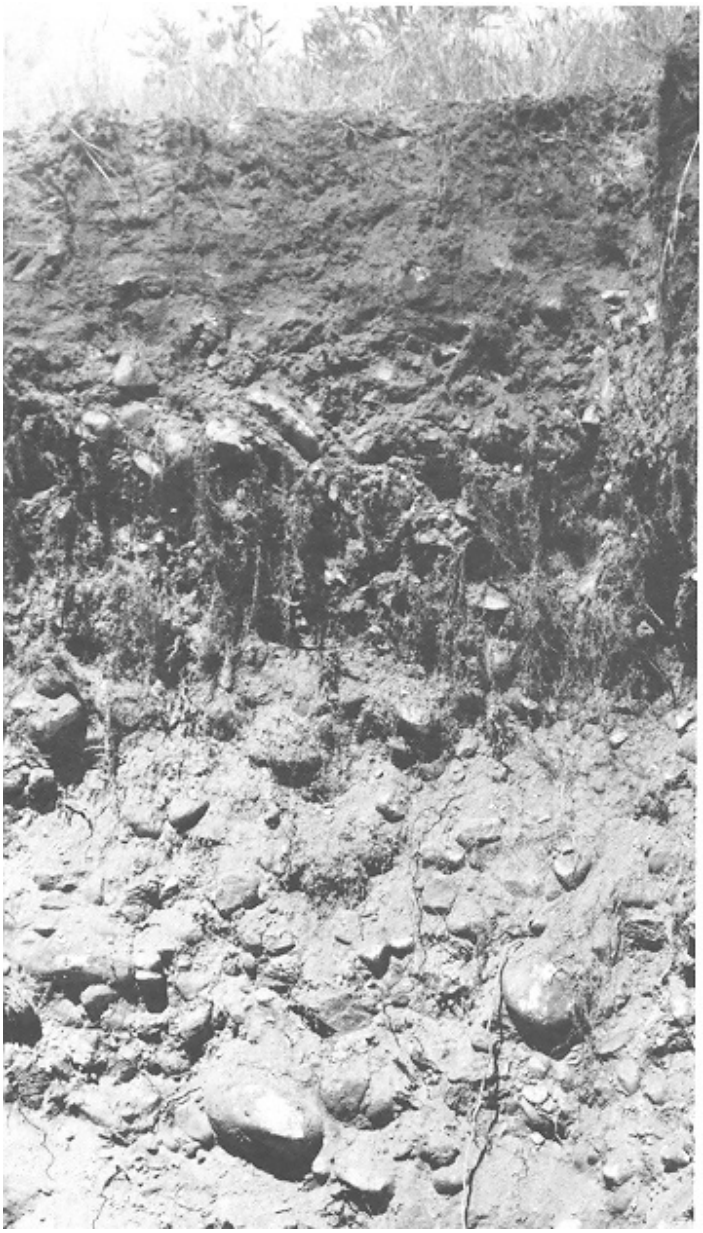

**Figure 10.-Profile of Raynoldson gravelly loam, 2 to 15 percent slopes, near Henrys Lake.**

Content of coarse fragments-20 to 70 percent
Content of clay-8 to 12 percent
Reaction-mildly alkaline or moderately alkaline
Texture-gravelly loam, very gravelly loam

Bk horizon:
Texture-extremely gravelly loamy sand, extremely gravelly sandy loam, very gravelly sandy loam
Content of rock fragments-55 to 90 percent
Content of clay-2 to 12 percent
Reaction-mildly alkaline or moderately alkaline

**Rexburg Series**

Depth class: Deep or very deep
Drainage class: Well drained
Position on landscape: Plains, loess-covered foothills
Parent material: Loess
Slope: 1 to 20 percent
Elevation: 5,030 to 5,800 feet
Average annual precipitation: 12 to 16 inches
Average annual air temperature: 39 to 44 degrees F
Frost-free period: 80 to 95 days
**Taxonomic class:** Coarse-silty, mixed, frigid Calcic Haploxerolls

**Typical Pedon**

Ap-0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few medium and coarse roots; many very fine and fine interstitial and tubular pores; neutral (pH 7.2); abrupt wavy boundary.

Bw1-5 to 14 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few medium and coarse roots; many very fine and fine tubular pores; neutral (pH 7.3); clear wavy boundary.

Bw2-14 to 25 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few medium and coarse roots; many very fine and fine tubular pores; mildly alkaline (pH 7.5); clear wavy boundary.

Bk1-25 to 38 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium roots; many very fine and fine tubular pores; many cicada nodules; strongly effervescent; moderately alkaline (pH 7.9); gradual irregular boundary.

Bk2-38 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few medium roots; common fine and medium tubular pores; strongly effervescent; moderately alkaline (pH 7.9).

**Typical Pedon Location**

Map unit in which located: Rexburg-Ririe silt loams, 4 to 12 percent slopes (fig. 11)

**Figure 11.-Profile of Rexburg silt loam, in an area of Rexburg-Ririe silt loams, 4 to 12 percent slopes.**

Location in survey area: About 3 miles southwest of Drummond, about 2,490 feet north and 2,490 feet west of the southeast corner of sec. 4, T. 7 N., R. 43 E.

**Range in Characteristics**

Depth to bedrock or to a hardpan: 40 inches or more
Depth to the calcic horizon: 18 to 35 inches
Thickness of the mollic epipedon: 12 to 20 inches

Ap horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Reaction-slightly acid to mildly alkaline

Bw horizon:
Value-5 or 6 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist
Reaction-neutral or mildly alkaline

Bk horizon:
Value-6 or 7 dry, 4 to 6 moist
Chroma-2 or 3 dry or moist
Reaction-mildly alkaline or moderately alkaline
Calcium carbonate equivalent-15 to 30 percent

**Rin Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Loess-covered foothills and hillsides
Parent material: Loess
Slope: 1 to 20 percent
Elevation: 5,500 to 6,100 feet
Average annual precipitation: 17 to 22 inches
Average annual air temperature: 38 to 41 degrees F
Frost-free period: 60 to 80 days
**Taxonomic class:** Coarse-silty, mixed Pachic Cryoborolls

**Typical Pedon**

Ap-0 to 7 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; medium acid (pH 5.8); abrupt smooth boundary.

A-7 to 12 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very thick platy structure; hard, friable, slightly sticky and plastic; common fine and very fine roots; few very fine pores; slightly acid (pH 6.2); clear wavy boundary.

Bt1-12 to 28 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few fine and very fine roots; few very fine pores; few thin clay films on faces of peds; uncoated silt grains on faces of peds; neutral (pH 6.8); gradual wavy boundary.

Bt2-28 to 36 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few fine and very fine roots; common very fine pores; few thin clay films on faces of peds; uncoated silt grains on faces of peds; neutral (pH 7.2); gradual wavy boundary.

Bt3-36 to 60 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard,

friable, slightly sticky and plastic; few fine and very fine roots; few very fine and fine pores; few thin clay films on faces of peds; neutral (pH 7.2).

**Typical Pedon Location**

Map unit in which located: Rin silt loam, 1 to 4 percent slopes
Location in survey area: About 1 mile north of Squirrel, about 425 feet south and 1,850 feet east of the northwest corner of sec. 8, T. 8 N., R. 44 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 16 to 30 inches

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

Bw horizon:
Value-5 or 6 dry, 3 or 4 moist
Chroma-3 or 4 dry or moist

**Ririe Series**

Depth class: Deep or very deep
Drainage class: Well drained
Position on landscape: Loess-covered foothills
Parent material: Loess
Slope: 1 to 20 percent
Elevation: 5,180 to 6,000 feet
Average annual precipitation: 12 to 18 inches
Average annual air temperature: 39 to 44 degrees F
Frost-free period: 75 to 95 days
**Taxonomic class:** Coarse-silty, mixed, frigid Calcic Haploxerolls

**Typical Pedon**

Ap-0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline (pH 7.6); abrupt wavy boundary.
AB-8 to 11 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline (pH 7.6); abrupt wavy boundary.
Bk1-11 to 20 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; violently effervescent; moderately alkaline (pH 8.0); gradual wavy boundary.
Bk2-20 to 34 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; strongly effervescent; common fine irregular soft masses of lime; moderately alkaline (pH 8.2); clear wavy boundary.
Bk3-34 to 51 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; strongly effervescent; common fine irregular soft masses of lime; moderately alkaline (pH 8.2); gradual wavy boundary.
Bk4-51 to 60 inches; light yellowish brown (10YR 6/4) silt loam, brown (10YR 4/3) moist; massive; very hard, firm, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline (pH 8.2).

**Typical Pedon Location**

Map unit in which located: Rexburg-Ririe silt loams, 1 to 4 percent slopes (fig. 12)
Location in survey area: About 4 miles northeast of Newdale, about 75 feet west and 1,750 feet south of the northeast corner of sec. 13, T. 7 N., R. 41 E.

**Range in Characteristics**

Depth to bedrock: More than 40 inches
Depth to the calcic horizon: 7 to 16 inches

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Reaction-neutral to moderately alkaline

B horizon:
Value-6 to 8 dry, 3 to 6 moist
Chroma-1 to 4 dry or moist
Effervescence-strongly effervescent or violently effervescent
Reaction-mildly alkaline to strongly alkaline

**Robana Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Foothills
Parent material: Loess
Slope: 1 to 20 percent
Elevation: 5,700 to 6,400 feet
Average annual precipitation: 16 to 22 inches
Average annual air temperature: 37 to 41 degrees F
Frost-free period: 50 to 70 days
**Taxonomic class:** Fine-silty, mixed Argic Pachic Cryoborolls

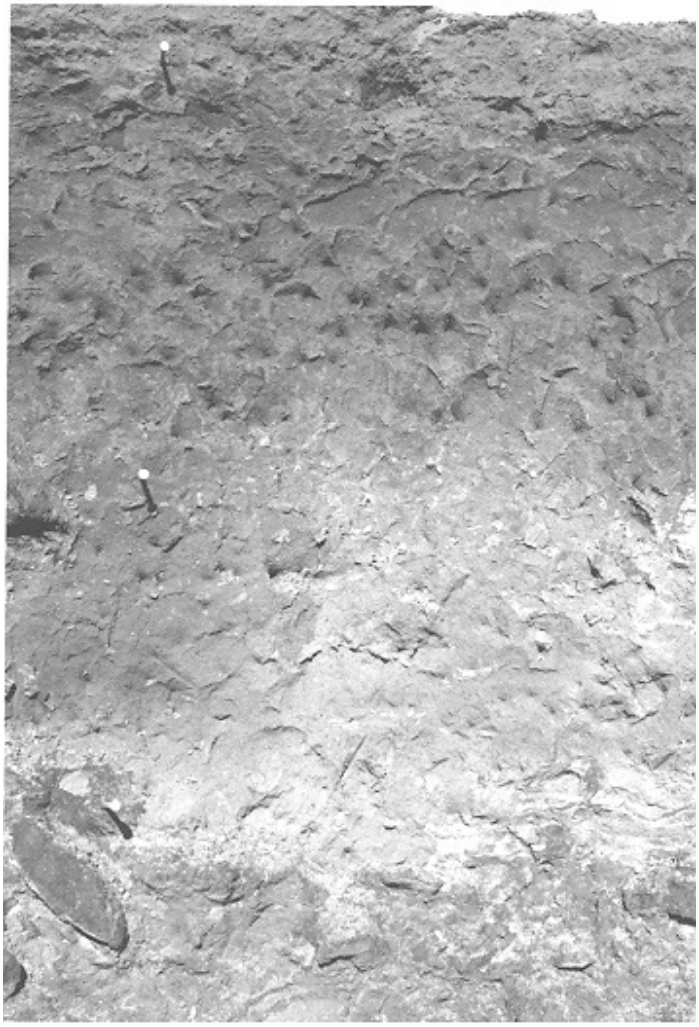

**Figure 12.-Profile of Ririe silt loam, in an area of Rexburg-Ririe silt loams, 1 to 4 percent slopes.**

### Typical Pedon

Ap1-0 to 8 inches; dark brown (10YR 4/3) silt loam, very dark brown (10YR 2/2) moist; moderate coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; few very fine tubular pores; medium acid (pH 6.0); abrupt smooth boundary.

Ap2-8 to 12 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; common fine and very fine tubular pores; medium acid (pH 6.0); abrupt smooth boundary.

BA-12 to 19 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; many very fine and fine, common medium, and few coarse tubular pores; many thick clay films lining pores and few moderately thick clay films on faces of peds; about 1 percent gravel; slightly acid (pH 6.1); gradual smooth boundary.

Bt1-19 to 34 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to strong medium and fine subangular blocky; very hard, very firm, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; many very fine and fine, common medium, and few coarse tubular pores; continuous thick clay films lining pores and continuous moderately thick clay films on faces of peds; common uncoated silt grains on faces of peds; about 1 percent gravel; about 5 percent nodules 0.5 inch in diameter; slightly acid (pH 6.4); gradual smooth boundary.

Bt2-34 to 43 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure parting to strong medium and fine subangular blocky; very hard, very firm, sticky and plastic; common very fine and fine and few medium roots; many very fine and fine and few medium and coarse tubular pores; many thick clay films on faces of peds; common uncoated silt grains on faces of peds; few 0.25-inch-thick lamellae about 4 inches apart; few krotovinas; about 1 percent gravel; neutral (pH 6.6); clear smooth boundary.

Bt3-43 to 54 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; many very fine and fine, common medium, and few coarse tubular pores; many moderately thick clay films lining pores and common moderately thick clay films on faces of peds; common uncoated silt grains on faces of peds; about 1 percent gravel; neutral (pH 6.8); clear wavy boundary.

2C-54 to 80 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; many very fine and fine tubular pores; many moderately thick clay films lining pores and common moderately thick clay films on faces of peds; few uncoated silt grains on faces of peds; about 2 percent gravel; neutral (pH 6.8).

### Typical Pedon Location

Map unit in which located: Robana-Rin silt loams, 4 to 12 percent slopes
Location in survey area: About 5 miles east and 1 mile north of Squirrel, about 2,230 feet east and 65 feet south of the northwest corner of sec. 8, T. 8 N., R. 45 E.

### Range in Characteristics

Thickness of the mollic epipedon: 16 to 36 inches
Base saturation: 80 to 100 percent
Reaction: Medium acid to mildly alkaline in the A horizon and slightly acid to mildly alkaline in the B and C horizons

A horizon:
- Value-4 or 5 dry, 2 or 3 moist
- Chroma-1 to 3 dry or moist

Bt horizon:
- Value-5 or 6 dry, 3 to 5 moist
- Chroma-2 to 4 dry or moist
- Texture-silt loam, silty clay loam
- Content of clay-20 to 35 percent
- Content of rock fragments-commonly less than 1 percent but ranges from 0 to 5 percent

C horizon.
- Hue-10YR or 7.5YR

## Robinlee Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Nearly level to undulating, loess-covered moraines and plains
Parent material: Glacial drift and some loess
Slope: 1 to 4 percent
Elevation: 5,250 to 5,650 feet
Average annual precipitation: 16 to 22 inches
Average annual air temperature: 39 to 43 degrees F
Frost-free period: 75 to 85 days
**Taxonomic class:** Fine-silty, mixed, frigid Calcic Pachic Argixerolls

### Typical Pedon

Ap-0 to 11 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine and fine tubular pores; about 1 percent gravel; neutral (pH 7.0); clear smooth boundary.

BA-11 to 23 inches; dark yellowish brown (10YR 4/4) silt loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; about 1 percent gravel; mildly alkaline (pH 7.4); gradual wavy boundary.

Bt-23 to 41 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; strong medium prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; few very fine and fine roots; common very fine and fine tubular pores; common moderately thick clay films on faces of peds and lining pores; few krotovinas; about 3 percent gravel; mildly alkaline (pH 7.8); clear wavy boundary.

Bky1-41 to 52 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, nonsticky and slightly plastic; few very fine roots; few very fine tubular pores; about 2 percent gravel; brittle cemented layer, 0.25 to 0.50 inch thick, at the base of the horizon; strongly effervescent; moderately alkaline (pH 8.2); clear broken boundary.

Bky2-52 to 63 inches; dark yellowish brown (10YR 4/4) loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable, nonsticky and nonplastic; few fine tubular pores; many fine gypsiferous filaments; violently effervescent; moderately alkaline (pH 8.4).

### Typical Pedon Location

Map unit in which located: Robinlee-Marystown silt loams, 1 to 4 percent slopes
Location in survey area: About 3 miles east of Marysville, about 1,325 feet south and 50 feet west of the northeast corner of sec. 27, T. 9 N., R. 43 E.

### Range in Characteristics

Thickness of the mollic epipedon: 20 to 35 inches
Depth to the calcic horizon: 30 to 43 inches
Content of stones, cobbles, and boulders: 0 to 5 percent

Ap horizon:
- Value-4 or 5 dry
- Chroma-2 or 3 dry or moist
- Content of gravel-0 to 5 percent

BA horizon:
- Value-4 or 5 dry, 3 or 4 moist
- Chroma-2 or 3 dry or moist
- Content of gravel-0 to 5 percent

Bt horizon.
- Value-4 to 6 dry, 3 to 5 moist
- Chroma-3 or 4 dry or moist

Texture-silt loam, silty clay loam
Content of gravel-0 to 5 percent
Content of clay-18 to 35 percent

Bkyl horizon:
Value-6 to 8 dry, 4 to 6 moist
Chroma-3 or 4 dry or moist
Texture-loam, silty clay loam, clay loam
Content of gravel-0 to 10 percent
Reaction-mildly alkaline or moderately alkaline

Bky2 horizon.
Value-4 to 8 dry, 3 to 6 moist
Chroma-2 to 4 dry or moist
Texture-loam, silty clay loam, clay loam
Content of gravel-5 to 15 percent
Reaction-mildly alkaline or moderately alkaline

**Sadorus Series**

Depth class: Shallow
Drainage class: Well drained
Position on landscape: Mountainsides, hillsides, fan terraces, ravines
Parent material: Residuum, loess, slope alluvium
Slope: 1 to 50 percent
Elevation: 5,100 to 5,850 feet
Average annual precipitation: 17 to 20 inches
Average annual air temperature: 37 to 40 degrees F
Frost-free period: 70 to 90 days
**Taxonomic class:** Loamy, mixed, frigid Lithic Haploxerolls

**Typical Pedon**

A-0 to 7 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; few fine tubular pores; about 3 percent angular cobbles and 18 percent gravel; neutral (pH 6.8); clear smooth boundary.
Bw-7 to 17 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few fine tubular pores and common fine vesicular pores; about 5 percent angular cobbles and 20 percent gravel; neutral (pH 7.0); abrupt wavy boundary.
2R-17 inches; densely welded rhyolitic tuff.

**Typical Pedon Location**

Map unit in which located: Vadnais-Sadorus-Rock outcrop complex, 2 to 8 percent slopes
Location in survey area: About 5 miles west and 6 miles north of Ashton, about 100 feet east and 2,500 feet south of the northwest corner of sec. 6, T. 9 N., R. 42 E.

**Range in Characteristics**

Depth to bedrock: 10 to 20 inches
Thickness of the mollic epipedon: 10 to 17 inches
Content of clay in the particle-size control section: 5 to 12 percent

A horizon:
Value-4 or 5 dry
Chroma-2 or 3 dry or moist

B horizon:
Value-4 to 6 dry, 3 or 4 moist
Chroma-2 or 3 dry or moist
Texture-gravelly loam, loam, gravelly sandy loam

**Sandcreek Series**

Depth class: Shallow
Drainage class: Excessively drained
Position on landscape: Basalt plains
Parent material: Eolian deposits
Slope: 1 to 6 percent
Elevation: 4,900 to 5,450 feet
Average annual precipitation: 14 to 18 inches
Average annual air temperature: 41 to 43 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Sandy, mixed, frigid Lithic Haploxerolls

**Typical Pedon**

A-0 to 5 inches; dark grayish brown (10YR 4/2) sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; common very fine, fine, and medium roots; few very fine tubular pores; 2 percent gravel; neutral (pH 7.2); clear smooth boundary.
AB-5 to 13 inches; dark grayish brown (10YR 4/2) sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable; common very fine, fine, and medium roots; few very fine tubular pores; 2 percent gravel; neutral (pH 7.2); clear smooth boundary.
Bw-13 to 18 inches; brown (10YR 4/3) cobbly sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to single grain; soft, very friable; common very fine, fine, and medium roots; few very fine tubular pores; 10 percent cobbles and 5 percent gravel; neutral (pH 7.2); abrupt wavy boundary.
2R-18 inches; vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Blacksan-Sandcreek-Rock outcrop complex, 1 to 6 percent slopes
Location in survey area: About 3 miles north of Parker, about 1,275 feet east and 100 feet north of the southwest corner of sec. 15, T. 8 N., R. 40 E.

**Range in Characteristics**

Depth to bedrock: 14 to 20 inches
Reaction: Neutral or mildly alkaline throughout the profile
Content of clay in the particle-size control section: 2 to 6 percent

A horizon:
Value and chroma-3 or 4 dry, 2 or 3 moist

AB horizon:
Value-3 or 4 dry, 2 or 3 moist
Chroma-2 to 4 dry or moist
Texture-sand, fine sand
Content of rock fragments-0 to 5 percent

B horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 to 4 dry or moist
Texture-cobbly sand, loamy sand, sand
Content of rock fragments-5 to 25 percent

**Sarilda Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Loess-covered basalt or rhyolite plains
Parent material: Loess
Slope: 1 to 6 percent
Elevation: 5,130 to 5,350 feet
Average annual precipitation: 15 to 17 inches
Average annual air temperature: 42 to 45 degrees F
Frost-free period: 85 to 95 days
**Taxonomic class:** Coarse-silty, mixed, frigid Pachic Haploxerolls

**Typical Pedon**

Ap-0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky; common very fine and fine roots; few very fine tubular pores; slightly acid (pH 6.4); clear smooth boundary.
A-8 to 22 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly plastic; many very fine and fine roots; few very fine tubular pores; neutral (pH 6.8); clear wavy boundary.
Bw-22 to 33 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly plastic; few fine and very fine roots; few fine tubular pores; neutral (pH 7.2); abrupt wavy boundary.
2R-33 inches; unweathered vesicular basalt.

**Typical Pedon Location**

Map unit in which located: Kucera-Sarilda silt loams, 2 to 6 percent slopes
Location in survey area: About 1 mile southwest of Ashton, about 590 feet west and 2,500 feet south of the northeast corner of sec. 2, T. 8 N., R. 42 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Content of clay in the control section: 6 to 18 percent
Reaction: Slightly acid or neutral throughout the profile
Content of rock fragments: 0 to 5 percent gravel and cobbles

A and Bw horizons:
Value-4 or 5 dry
Chroma-2 or 3 dry or moist
Texture-silt loam, very fine sandy loam

**Sawtelpeak Series**

Depth class: Very deep
Drainage class: Poorly drained
Position on landscape: Lacustrine terraces
Parent material: Alluvial and lacustrine material
Slope: 0 to 2 percent
Elevation: 6,400 to 6,700 feet
Average annual precipitation: 18 to 26 inches
Average annual air temperature: 35 to 38 degrees F
Frost-free period. 30 to 60 days
**Taxonomic class:** Fine, montmorillonitic Typic Cryaquolls

**Typical Pedon**

Oi-4 inches to 0; mat of decayed, partially decayed, and live roots.
A-0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to strong fine granular; hard, firm, sticky and plastic; many very fine and fine roots; common very fine tubular pores; neutral (pH 6.6); abrupt smooth boundary.
Bg1-8 to 16 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; many medium

distinct black (10YR 2/1 moist) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common very fine tubular pores; neutral (pH 6.7); abrupt wavy boundary.

Bg2-16 to 18 inches; grayish brown (10YR 5/2) silty clay, gray (5Y 5/1) moist; moderate medium subangular blocky structure parting to strong fine granular; hard, firm, sticky and plastic; common very fine tubular pores; neutral (pH 6.8); abrupt wavy boundary.

2Ab-18 to 26 inches; dark grayish brown (10YR 4/2) silty clay, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to strong fine granular; hard, firm, sticky and plastic; common very fine and fine roots; common very fine tubular pores; neutral (pH 6.9); abrupt smooth boundary.

3C1-26 to 43 inches; light brown (7.5YR 6/4) silty clay, brown (7.5YR 5/4) moist; few medium distinct strong brown (7.5YR 4/6) and few medium prominent gray (5Y 5/1) mottles; massive; hard, firm, sticky and plastic; mildly alkaline (pH 7.4); abrupt smooth boundary.

4C2-43 to 57 inches; very pale brown (10YR 7/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; few medium distinct strong brown (7.5YR 4/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; about 35 percent gravel; mildly alkaline (pH 7.7); abrupt smooth boundary.

4C3-57 to 60 inches; very pale brown (10YR 7/4) very gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, friable; about 40 percent gravel; mildly alkaline (pH 7.7).

### Typical Pedon Location

Map unit in which located: Sawtelpeak silty clay, 0 to 2 percent slopes

Location in survey area: About 4 miles north of Island Park Lodge, about 50 feet west and 70 feet north of the southeast corner of sec. 36, T. 15 N., R. 43 E.

### Range in Characteristics

Depth to the seasonal high water table: 6 to 24 inches
Depth to gravelly or very gravelly material: 40 to 60 inches
Thickness of the mollic epipedon: 8 to 15 inches

A horizon:

Hue-10YR to 5Y
Value-2 to 4 dry, 2 or 3 moist
Chroma-1 to 3 dry or moist
Reaction-slightly acid or neutral

Bg horizon:

Hue-7.5YR to 5Y
Value-5 to 7 dry, 3 to 8 moist
Chroma-1 to 3 dry or moist
Reaction-neutral or mildly alkaline
Texture-silty clay loam, silty clay
Content of rock fragments-0 to 10 percent

C1 horizon:

Hue-7.5YR to 5Y
Value-4 to 7 dry, 2 to 6 moist
Chroma-1 to 6 dry or moist
Reaction-mildly alkaline or moderately alkaline
Texture-silty clay, silty clay loam
Content of rock fragments-0 to 10 percent

## Shotgun Series

Depth class: Moderately deep
Drainage class: Well drained Position on landscape: Basalt plains Parent material: Loess Slope: 1 to 12 percent
Elevation: 6,420 to 6,550 feet
Average annual precipitation: 25 to 30 inches
Average annual air temperature: 36 to 38 degrees F
Frost-free period: 30 to 50 days
**Taxonomic class:** Fine-loamy, mixed Argic Cryoborolls

### Typical Pedon

A-0 to 7 inches; dark brown (10YR 3/3) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, slightly plastic; many fine, common medium, and few coarse roots; about 3 percent gravel; neutral (pH 6.6); clear smooth boundary.

BA-7 to 14 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly plastic; few fine and common medium roots; few fine and medium tubular pores; about 5 percent gravel and cobbles; medium acid (pH 5.9); clear smooth boundary.

Bt-14 to 30 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and common medium roots; few fine and medium tubular pores; about 10 percent gravel and cobbles; medium acid (pH 5.9); abrupt wavy boundary.

2R-30 inches; unweathered vesicular basalt.

### Typical Pedon Location

Map unit in which located: Shotgun loam, 1 to 4 percent slopes

Location in survey area: About 2 miles north of the

Island Park Reservoir, about 2,400 feet south and 100 feet west of the northeast corner of sec. 21, R. 13 N., T. 42 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Thickness of the mollic epipedon: 12 to 16 inches

Particle-size control section:
Content of clay-20 to 27 percent
Content of coarse fragments-5 to 10 percent

A horizon:
Value-3 or 4 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Reaction-slightly acid or neutral

B horizon:
Hue-10YR or 7.5YR
Value-4 to 6 dry, 2 to 4 moist
Chroma-2 to 4 dry or moist
Texture-loam, silt loam
Reaction-medium acid to neutral

**Siddoway Series**

Depth class: Deep or very deep
Drainage class: Well drained
Position on landscape: Basalt plains, hillsides
Parent material: Eolian deposits, residuum
Slope: 1 to 25 percent
Elevation: 5,000 to 6,100 feet
Average annual precipitation: 14 to 18 inches
Average annual air temperature: 37 to 44 degrees F
Frost-free period: 70 to 100 days
**Taxonomic class:** Sandy, mixed, frigid Calcic Haploxerolls

**Typical Pedon**

A1-0 to 5 inches; dark brown (10YR 3/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable; many fine and very fine roots; few very fine tubular pores; neutral (pH 7.2); clear smooth boundary.

A2-5 to 19 inches; dark brown (10YR 4/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable; common fine and very fine and few medium roots; few very fine tubular pores; about 5 percent gravel; mildly alkaline (pH 7.8); clear wavy boundary.

Bw-19 to 28 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; soft, friable, slightly plastic; common fine and very fine roots; few very fine tubular pores; mildly alkaline (pH 7.8); clear wavy boundary.

Bk1-28 to 40 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable; few very fine roots; few very fine tubular pores; about 10 percent gravel; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2-40 to 48 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; massive; slightly hard, friable; few very fine roots; few very fine tubular pores; about 10 percent gravel; violently effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

Bk3-48 to 53 inches; white (10YR 8/2) loamy fine sand, pale brown (10YR 6/3) moist; massive; slightly hard, friable; few very fine roots; common very fine tubular pores; about 10 percent gravel and 5 percent cobbles; violently effervescent; strongly alkaline (pH 8.6); abrupt wavy boundary.

2R-53 inches; basalt.

**Typical Pedon Location**

Map unit in which located: Siddoway-Jipper-Jipper, loamy substratum complex, 1 to 20 percent slopes

Location in survey area: About 7 miles north of Parker, about 3,630 feet west and 2,340 feet south of the northeast corner of sec. 7, T. 8 N., R. 40 E.

**Range in Characteristics**

Thickness of the mollic epipedon: 20 to 40 inches
Depth to secondary lime: 18 to 29 inches Depth to bedrock: More than 40 inches
Content of clay in the particle-size control section: 7 to 12 percent

A horizon:
Value-3 or 4 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

B horizon:
Value-4 to 8 dry, 3 to 6 moist
Chroma-2 or 3 dry or moist
Texture-loamy sand, loamy fine sand, gravelly sand, gravelly loamy fine sand, very gravelly loamy fine sand
Content of pebbles-0 to 40 percent

**Snowshoe Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Basalt plains

Parent material: Eolian deposits
Slope: 1 to 12 percent
Elevation: 5,300 to 5,500 feet
Average annual precipitation: 13 to 16 inches
Average annual air temperature: 41 to 43 degrees
Frost-free period: 60 to 90 days
**Taxonomic class:** Coarse-loamy, mixed, frigid Typic Xerochrepts

**Typical Pedon**

A1-0 to 8 inches; brown (10YR 5/3) loamy fine sand, very dark brown (10YR 2/2) moist; massive; soft, very friable; common fine and medium roots; neutral (pH 7.1); gradual smooth boundary.
A2-8 to 22 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable; common fine and medium roots; neutral (pH 7.1); gradual smooth boundary.
Bw1-22 to 28 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable; few fine and medium roots; neutral (pH 7.2); clear smooth boundary.
Bw2-28 to 40 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; strong medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and medium roots; few fine and medium tubular pores; mildly alkaline (pH 7.4); clear smooth boundary.
C-40 to 60 inches; light yellowish brown (10YR 6/4) loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; slightly effervescent; mildly alkaline (pH 7.6).

**Typical Pedon Location**

Map unit in which located: Snowshoe loamy fine sand, 1 to 6 percent slopes
Location in survey area: About 8 miles north and 7 miles west of Parker, about 2,550 feet north and 350 feet east of the southwest corner of sec. 29, T. 9 N., R. 39 E.

**Range in Characteristics**

A horizon:
Value-4 to 6 dry, 2 to 4 moist
Chroma-2 or 3 dry or moist

Bw horizon:
Value-5 or 6 dry, 3 to 5 moist
Texture-fine sandy loam, loamy fine sand, loam, fine sand
Effervescence-noneffervescent or slightly effervescent

**Splitbutte Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Ridges, shoulder slopes, hillsides, and mountainsides on rhyolite plains
Parent material: Side slope alluvium, residuum, and some loess
Slope: 5 to 45 percent
Elevation: 5,900 to 6,500 feet
Average annual precipitation: 17 to 20 inches
Average annual air temperature: 37 to 39 degrees F
Frost-free period: 50 to 65 days
**Taxonomic class:** Loamy-skeletal, mixed Pachic Cryoborolls

**Typical Pedon**

A1-0 to 4 inches; dark brown (10YR 3/3) very gravelly loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; hard, very friable, slightly plastic; many very fine and fine and few medium and coarse roots; many very fine interstitial pores; 35 percent gravel; slightly acid (pH 6.4); gradual smooth boundary.
A2-4 to 12 inches; dark brown (7.5YR 3/2) extremely gravelly loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common fine interstitial pores and few fine tubular pores; 60 percent gravel; slightly acid (pH 6.5); clear smooth boundary.
Bw-12 to 25 inches; yellowish brown (10YR 5/4) extremely gravelly loam, very dark gray (N 3/0) moist; weak fine subangular blocky structure; very friable; few fine roots; common fine interstitial pores; 80 percent gravel; neutral (pH 6.8); abrupt wavy boundary.
R-25 inches; fractured rhyolite.

**Typical Pedon Location**

Map unit in which located: Povey-Splitbutte-Rock outcrop complex, 5 to 20 percent slopes
Location in survey area: About 1 mile west and 2 miles north of the Sandcreek Reservoir, about 1,750 feet west and 1,500 feet south of the northeast corner of sec. 5, T. 10 N., R. 41 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches
Thickness of the mollic epipedon: 16 to 37 inches
Content of clay in the particle-size control section: 8 to 12 percent

A horizon:

Hue-10YR or 7.5YR
Value-3 to 5 dry, 2 or 3 moist
Chroma-2 to 4 dry or moist
Reaction-neutral or slightly acid

Bw horizon:

Hue-10YR or 7.5YR
Value-4 or 5 dry, 2 or 3 moist
Chroma-3 or 4 dry
Reaction-neutral to medium acid
Texture-extremely gravelly loam, extremely stony loam

**Spliten Series**

Depth class: Shallow
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Loess, residuum
Slope: 1 to 12 percent
Elevation: 5,200 to 6,500 feet
Average annual precipitation: 20 to 30 inches
Average annual air temperature: 37 to 40 degrees F
Frost-free period: 40 to 80 days

**Taxonomic class:** Loamy, mixed Lithic Cryoborolls

**Typical Pedon**

A-0 to 4 inches; brown (10YR 4/3) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky; few medium and many very fine roots; about 5 percent angular basalt gravel; slightly acid (pH 6.2); clear smooth boundary.

Bw-4 to 17 inches; brown (7.5YR 5/4) loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; neutral (pH 6.8); clear smooth boundary.

R-17 inches; unweathered basalt.

**Typical Pedon Location**

Map unit in which located: Spliten-Shotgun-Rock outcrop complex, 1 to 12 percent slopes

Location in survey area: About 10 miles west of Elk Creek Station, about 1,800 feet north and 400 feet west of the southeast corner of sec. 24, T. 13 N., R. 41 E.

**Range in Characteristics**

Depth to bedrock: 10 to 20 inches
Thickness of the mollic epipedon: 7 to 17 inches

Particle-size control section:

Content of clay-8 to 18 percent
Content of gravel-0 to 25 percent

A horizon:

Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

Bw horizon:

Hue-7.5YR or 10YR
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 to 4 dry or moist
Reaction-medium acid to neutral
Texture-loam, sandy loam, gravelly sandy loam

**Stamp Series**

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on landscape: Flood plains, outwash plains
Parent material: Alluvium
Slope: 0 to 4 percent Elevation:
6,000 to 7,000 feet
Average annual precipitation: 28 to 35 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Coarse-loamy, mixed Aquic Cryochrepts

**Typical Pedon**

A-0 to 5 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; medium acid (pH 6.0); clear smooth boundary.

Bw1-5 to 11 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; slightly acid (pH 6.4); clear smooth boundary.

Bw2-11 to 20 inches; grayish brown (10YR 5/2) loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine roots; neutral (pH 6.6); gradual smooth boundary.

C1-20 to 29 inches; light brownish gray (10YR 6/2) coarse sandy loam, grayish brown (10YR 5/2) moist; few fine distinct brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure parting to moderate medium and fine subangular blocky; slightly hard, very friable, slightly sticky;

common medium and fine roots; neutral (pH 6.8); gradual smooth boundary.
C2-29 to 36 inches; light gray (10YR 7/2) coarse sandy loam, grayish brown (10YR 5/2) moist; common fine distinct brownish yellow (10YR 6/8) mottles; moderate coarse subangular blocky structure parting to moderate medium and fine subangular blocky; slightly hard, very friable; few fine and medium roots; neutral (pH 7.0); clear smooth boundary.
C3-36 to 38 inches; light gray (2.5Y 7/2) coarse sandy loam, grayish brown (2.5YR 5/2) moist; common medium distinct brownish yellow (10YR 6/8) mottles; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; neutral (pH 7.0); clear smooth boundary.
2C4-38 to 60 inches; variegated gravelly coarse sand; loose; neutral (pH 7.2).

**Typical Pedon Location**

Map unit in which located: Stamp loam, ponded, 0 to 4 percent slopes
Location in survey area: About 1 mile east of Ponds Lodge, about 2,140 feet east and 1,640 feet south of the northwest corner of sec. 26, T. 13 N., R. 43 E.

**Range in Characteristics**

Seasonal high water table: 12 inches above to 36 inches below the surface
Depth to mottles: 2 to 25 inches

A horizon:
Value-4 to 7 dry, 2 to 4 moist
Chroma-1 to 3 dry or moist
Reaction-medium acid to moderately alkaline

Bw horizon:
Hue-10YR or 5Y
Value-5 to 7 dry, 3 to 5 moist
Chroma-2 to 4 dry or moist
Content of coarse fragments-0 to 15 percent
Reaction-medium acid to mildly alkaline

C horizon:
Mottles-few or common, fine or medium, faint or distinct
Content of coarse fragments-0 to 30 percent
Reaction-medium acid to mildly alkaline

**St. Anthony Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Stream terraces
Parent material: Gravelly alluvium
Slope: 0 to 4 percent
Elevation: 4,500 to 5,500 feet
Average annual precipitation: 13 to 16 inches
Average annual air temperature: 41 to 45 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Loamy-skeletal, mixed, frigid Pachic Haploxerolls

**Typical Pedon**

Ap-0 to 7 inches; dark brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate very fine granular; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium and common very fine roots; many very fine and few fine pores; about 20 percent gravel; few pressure faces on pebbles; neutral (pH 7.0); abrupt smooth boundary.
Bw1-7 to 12 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate very fine and fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine and few fine interstitial pores; about 25 percent gravel; few pressure faces on pebbles; neutral (pH 7.0); clear wavy boundary.
Bw2-12 to 21 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 3/3) moist; weak fine granular structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; about 50 percent gravel; many pressure faces on pebbles; thin coatings of lime on the underside of pebbles; neutral (pH 7.2); gradual wavy boundary.
2C-21 to 60 inches; dark gray (10YR 4/1) gravel and coarse sand; single grain; loose; few very fine roots; about 70 percent gravel; few coatings of lime on the underside of some pebbles.

**Typical Pedon Location**

Map unit in which located: St. Anthony gravelly sandy loam, 0 to 4 percent slopes
Location in survey area: About 1 mile south of St. Anthony, about 650 feet north and 500 feet west of the southeast corner of sec. 12, T. 7 N., R. 40 E.

**Range in Characteristics**

Depth to loose gravel and sand: 20 to 40 inches
Thickness of the mollic epipedon: 20 to 36 inches
Reaction: Neutral or mildly alkaline throughout the profile

Ap horizon:
Value-4 or 5 dry, 2 or 3 moist

Chroma-2 or 3 dry or moist

Bw horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Texture-gravelly sandy loam, very gravelly sandy loam, very gravelly sandy clay loam
Content of clay-15 to 23 percent

2C horizon:
Content of coarse fragments-35 to 80 percent

## Stipe Series

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Basalt plains, hillsides
Parent material: Eolian deposits
Slope: 1 to 8 percent
Elevation: 5,000 to 5,800 feet
Average annual precipitation: 13 to 16 inches
Average annual air temperature: 37 to 42 degrees F
Frost-free period: 80 to 100 days
**Taxonomic class:** Coarse-loamy, mixed, frigid Calcic Pachic Haploxerolls

### Typical Pedon

A-0 to 12 inches; brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable; common fine and very fine roots; common fine and very fine tubular pores; about 5 percent gravel; mildly alkaline (pH 7.7); gradual wavy boundary.

Bw1-12 to 18 inches; brown (10YR 4/3) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly plastic; few very fine roots; few very fine tubular pores; about 5 percent gravel; mildly alkaline (pH 7.7); gradual wavy boundary.

Bw2-18 to 34 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 3/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly plastic; few fine roots; few fine tubular pores; about 5 percent gravel, 5 percent cobbles, and 4 percent stones; moderately alkaline (pH 7.9); abrupt wavy boundary.

Bk-34 to 36 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; moderate medium and coarse subangular blocky structure; soft, friable, slightly plastic; violently effervescent; moderately alkaline (pH 8.0); abrupt irregular boundary.

2R-36 inches; unweathered vesicular basalt.

### Typical Pedon Location

Map unit in which located: Jipper-Nayrib-Stipe complex, 1 to 8 percent slopes
Location in survey area: About 8 miles north of Parker, about 530 feet east and 260 feet south of the northwest corner of sec. 33, T. 9 N., R. 40 E.

### Range in Characteristics

Depth to bedrock: 20 to 40 inches
Thickness of the mollic epipedon: 25 to 34 inches
Content of rock fragments: 0 to 10 percent

A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist
Reaction-slightly acid to mildly alkaline

Bw horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 to 4 dry or moist
Texture-fine sandy loam, very fine sandy loam
Content of clay-11 to 18 percent

Bk horizon:
Value-6 or 7 dry, 2 or 3 moist
Chroma-2 to 4 dry or moist
Texture-fine sandy loam, very fine sandy loam
Content of clay-13 to 18 percent
Calcium carbonate equivalent-1 to 5 percent
Reaction-mildly alkaline or moderately alkaline

## Stringam Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Basalt plains
Parent material: Eolian deposits, alluvium
Slope: 1 to 6 percent
Elevation: 6,550 to 6,700 feet
Average annual precipitation: 20 to 30 inches
Average annual air temperature: 33 to 37 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Fine-loamy, mixed Mollic Cryoboralfs

### Typical Pedon

O-0.5 inch to 0; decomposing lodgepole pine litter, grasses, and moss.

A1-0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak thick platy structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine, common medium, and few coarse roots; common fine tubular pores; about 5 percent cobbles; medium acid (pH 5.9); abrupt smooth boundary.

A2-4 to 9 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; common fine tubular pores; about 5 percent cobbles; medium acid (pH 5.9); abrupt smooth boundary.

Bt1-9 to 17 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; strong fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; few fine tubular pores; common moderately thick clay films on faces of peds; about 3 percent cobbles; slightly acid (pH 6.1); clear smooth boundary.

Bt2-17 to 26 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 3/4) moist; strong medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few medium and coarse roots; few fine tubular pores; common thick clay films on faces of peds; about 5 percent gravel; slightly acid (pH 6.1); clear smooth boundary.

Bt3-26 to 39 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 3/4) moist; strong medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and few medium and coarse roots; few fine tubular pores; continuous thick clay films on faces of peds; about 5 percent gravel; slightly acid (pH 6.1); gradual smooth boundary.

Bt4-39 to 57 inches; light yellowish brown (10YR 6/4) sandy clay loam, brown (10YR 4/3) moist; strong medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and medium roots; few fine tubular pores; common thin clay films on faces of peds; about 2 percent cobbles; slightly acid (pH 6.1); gradual smooth boundary.

Bt5-57 to 65 inches; light yellowish brown (10YR 6/4) sandy clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine and medium roots; few fine tubular pores; common thin clay films on faces of peds; about 10 percent gravel, 3 percent cobbles, and 1 percent stones; slightly acid (pH 6.2).

**Typical Pedon Location**

Map unit in which located: Stringam-Judkins complex, 1 to 6 percent slopes

Location in survey area: About 8 miles west of the Island Park Reservoir, about 720 feet west and 1,940 feet north of the southeast corner of sec. 9, T. 12 N., R. 40 E.

**Range in Characteristics**

Depth to sandy clay loam: 30 to 40 inches

A horizon:
- Value-5 to 7 dry
- Chroma-2 or 3 dry or moist
- Reaction-medium acid or slightly acid

Bt horizon:
- Value-4 or 5 moist
- Chroma-2 to 4 dry or moist
- Texture-sandy clay loam, clay loam, loam, gravelly clay loam, very gravelly clay loam, gravelly silty clay loam

**Sudpeak Series**

Depth class: Very deep
Drainage class: Moderately well drained
Position on landscape: Alluvial fans
Parent material: Alluvium
Slope: 0 to 2 percent
Elevation: 4,800 to 6,600 feet
Average annual precipitation: 22 to 26 inches
Average annual air temperature: 36 to 46 degrees F
Frost-free period: 40 to 60 days

**Taxonomic class:** Fine, montmorillonitic Argic Pachic Cryoborolls

**Typical Pedon**

A-0 to 15 inches; dark grayish brown (10YR 4/2) gravelly clay, very dark brown (10YR 2/2) moist; moderate medium granular structure; hard, friable, sticky and plastic; many very fine and fine roots; about 20 percent gravel; slightly acid (pH 6.4); clear smooth boundary.

Bt-15 to 41 inches; light yellowish brown (10YR 6/4) gravelly clay, dark brown (10YR 4/3) moist; strong medium subangular blocky structure parting to moderate medium granular; hard, friable, sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; about 32 percent gravel; slightly acid (pH 6.4); clear wavy boundary.

Cg-41 to 60 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; few fine distinct yellowish red (5YR 4/6 moist) mottles; massive; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; about 10 percent gravel; slightly acid (pH 6.2).

**Typical Pedon Location**

Map unit in which located: Sudpeak-Stringam, gravelly

subsoil complex, 0 to 3 percent slopes
Location in survey area: About 4 miles north of the Island Park Reservoir, about 2,080 feet west and 980 feet north of the southeast corner of sec. 1, T. 13 N., R. 41 E.

**Range in Characteristics**

Reaction: Slightly acid or neutral throughout the profile

Particle-size control section:
Content of clay-35 to 45 percent
Content of coarse fragments-0 to 30 percent

A horizon:
Value-3 or 4 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

Bt horizon:
Hue-10YR or 7.5YR
Value-4 to 6 dry, 3 to 5 moist
Chroma-3 to 6 dry, 2 to 4 moist
Texture-gravelly clay loam, gravelly clay

Cg horizon:
Value-5 to 7 dry, 3 to 5 moist
Chroma-2 to 4 dry or moist

**Targhee Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Mountainsides, hillsides
Parent material: Residuum, slope alluvium
Slope: 1 to 60 percent
Elevation: 6,200 to 6,800 feet
Average annual precipitation: 25 to 35 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Loamy-skeletal, mixed Typic Cryochrepts

**Typical Pedon**

A-0 to 5 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; strong fine granular structure; slightly hard, friable; many very fine and fine and common medium roots; common very fine discontinuous random vesicular pores; medium acid (pH 5.6); gradual smooth boundary.
Bw-5 to 14 inches; light gray (10YR 7/2) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable; many very fine and fine and common medium roots; common very fine discontinuous random vesicular pores; about 25 percent gravel; slightly acid (pH 6.2); gradual wavy boundary.
C1-14 to 30 inches; white (10YR 8/1) very gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable; many fine and common medium roots; few very fine oblique vesicular pores; about 35 percent gravel; slightly acid (pH 6.1); gradual wavy boundary.
2C2-30 to 36 inches; white (10YR 8/1) extremely cobbly sand, light brownish gray (10YR 6/2) moist; single grain; loose; about 40 percent gravel and 50 percent cobbles; medium acid (pH 6.0); abrupt wavy boundary.
2R-36 inches; rhyolitic tuff.

**Typical Pedon Location**

Map unit in which located: Targhee loam, 1 to 15 percent slopes
Location in survey area: About 1 mile south of Elk Creek Station, about 800 feet south and 500 feet west of the northeast corner of sec. 23, T. 13 N., R. 43 E.

**Range in Characteristics**

Depth to bedrock: 20 to 40 inches

A horizon:
Value-5 to 7 dry
Chroma-2 or 3 moist
Reaction-medium acid to neutral

Bw horizon:
Value-7 or 8 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist
Texture-gravelly loam, gravelly sandy loam, very gravelly loam, very gravelly sandy loam
Content of clay-6 to 10 percent
Content of rock fragments-25 to 60 percent

C horizon:
Value-5 or 6 moist
Chroma-1 or 2 dry
Texture-very cobbly sand, extremely cobbly sand, extremely cobbly loamy sand, very gravelly sandy loam
Reaction-slightly acid or medium acid

**Tepete Series**

Depth class: Very deep
Drainage class: Very poorly drained
Position on landscape: Low-lying basins on the lower part of alluvial fans
Parent material: Residual material derived from sedges and rushes over mixed alluvium
Slope: 0 to 1 percent
Elevation: 6,400 to 6,800 feet
Average annual precipitation: 18 to 20 inches
Average annual air temperature: 39 to 41 degrees F

Frost-free period: 30 to 65 days
**Taxonomic class:** Loamy, mixed, euic Terric Borohemists

**Typical Pedon**

Oe1-0 to 6 inches; black (10YR 2/1), slightly decomposed hemic material that has plant fibers; dark olive gray (5Y 3/2) moist; many very fine and fine and common medium roots; neutral (pH 6.7); clear smooth boundary.

Oe2-6 to 16 inches; very dark brown (10YR 2/2), moderately well decomposed hemic material, black (5Y 2/1) moist; many very fine and common fine and medium roots; neutral (pH 6.8); gradual wavy boundary.

Oe3-16 to 25 inches; black (10YR 2/1), moderately decomposed hemic material, dark olive gray (5Y 3/2) moist; few very fine and fine roots; neutral (pH 7.2); gradual wavy boundary.

Oe4-25 to 34 inches; very dark brown (10YR 2/2), moderately decomposed hemic material that has thin bands of gray (5Y 6/1) silty clay loam; dark gray (5Y 4/1) moist; massive; extremely hard, very friable, sticky and plastic; neutral (pH 7.2); clear smooth boundary.

2Cg-34 to 60 inches; light gray (5Y 6/1) silty clay loam, dark gray (5Y 4/1) moist; partially decomposed plant remains; common fine prominent black (10YR 2/1) and few distinct very dark grayish brown (10YR 3/2) stains around roots and in channels; massive; very hard, friable, very sticky and very plastic; moderately alkaline (pH 8.0).

**Typical Pedon Location**

Map unit in which located: Tepete-Bootjack complex, 0 to 1 percent slopes

Location in survey area: About 2 miles northwest of the junction of U.S. Highway 20 and State Highway 87, about 1,001 feet south and 2,002 feet east of the northwest corner of sec. 3, T. 15 N., R. 43 E.

**Range in Characteristics**

Depth to sand and gravel: More than 60 inches

O horizon:
Hue-5Y or 10YR
Value-2 or 3 broken, rubbed, or pressed
Reaction-neutral or mildly alkaline

**Tetonia Series**

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Foothills
Parent material: Weakly calcareous loess
Slope: 1 to 20 percent
Elevation: 5,600 to 6,100 feet
Average annual precipitation: 13 to 18 inches
Average annual air temperature: 37 to 40 degrees F
Frost-free period: 50 to 100 days
**Taxonomic class:** Coarse-silty, mixed Calcic Pachic Cryoborolls

**Typical Pedon**

Ap1-0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; few very fine tubular pores; mildly alkaline (pH 7.4); abrupt smooth boundary.

Ap2-5 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; few fine tubular pores; mildly alkaline (pH 7.4); clear smooth boundary.

Bw1-9 to 19 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure; hard, firm, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine and few fine tubular pores; mildly alkaline (pH 7.8); gradual smooth boundary.

Bw2-19 to 27 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few very fine roots; common very fine and fine tubular pores; moderately alkaline (pH 8.0); gradual wavy boundary.

Bk1-27 to 42 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; common fine and few very fine tubular pores; many fine irregular soft masses of lime; strongly effervescent; moderately alkaline (pH 8.4); gradual wavy boundary.

Bk2-42 to 51 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; common fine irregular soft masses of lime; slightly effervescent; moderately alkaline (pH 8.4); gradual wavy boundary.

C-51 to 60 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; common fine irregular soft masses of lime;

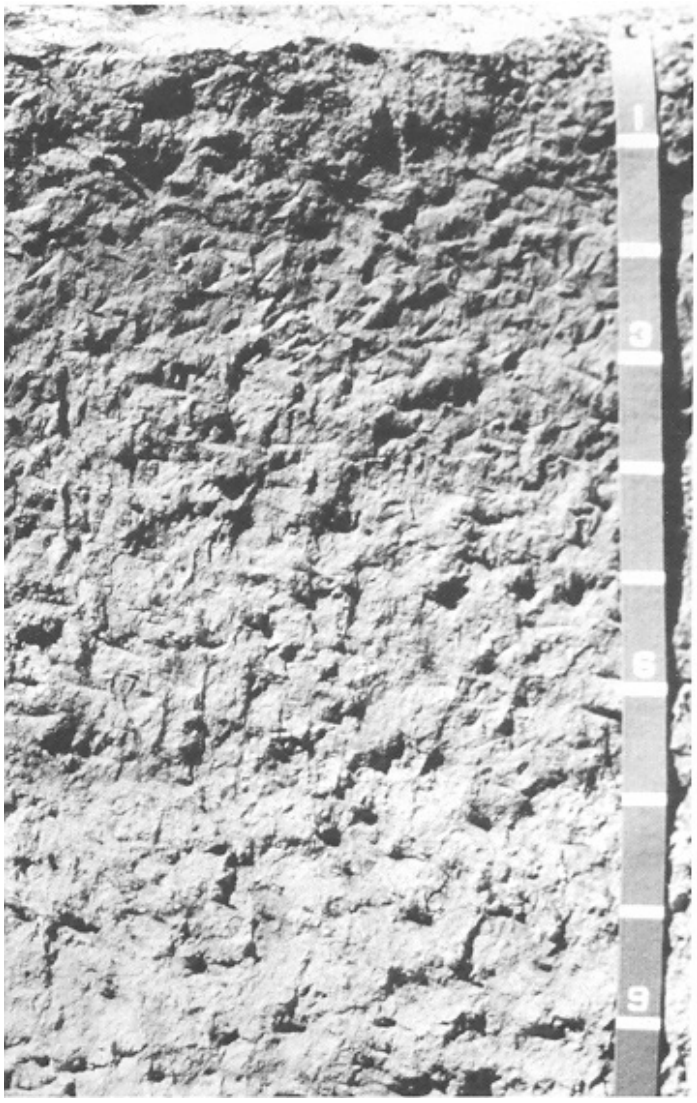

**Figure 13.-Profile of Tetonia silt loam, in an area of Tetonia-Lantonia silt loams, 4 to 12 percent slopes.**

slightly effervescent; moderately alkaline (pH 8.4).

### Typical Pedon Location

Map unit in which located: Tetonia-Lantonia silt loams, 4 to 12 percent slopes (fig. 13)
Location in survey area: About 1 mile west of France, about 2,310 feet west and 170 feet north of the southeast corner of sec. 32, T. 8 N., R. 44 E.

### Range in Characteristics

Thickness of the mollic epipedon: 16 to 27 inches
Depth to the calcic horizon: 16 to 35 inches A horizon:
Value-4 or 5 dry, 2 or 3 moist
Chroma-2 or 3 dry or moist

Bw horizon:
Value-5 or 6 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist
Base saturation-85 to 95 percent
Content of clay-12 to 18 percent
Reaction-neutral to moderately alkaline

Bk horizon:
Reaction-moderately alkaline or strongly alkaline

## Trude Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Outwash plains, stream terraces
Parent material: Alluvium
Slope: 0 to 4 percent
Elevation: 6,000 to 7,000 feet
Average annual precipitation: 28 to 35 inches
Average annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 60 days
**Taxonomic class:** Sandy-skeletal, mixed Dystric Cryochrepts

### Typical Pedon

A-0 to 5 inches; yellowish brown (10YR 5/4) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; many very fine roots; about 15 percent gravel; neutral (pH 6.8); abrupt wavy boundary.

Bw1-5 to 12 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; moderate fine subangular blocky structure; soft, very friable; common very fine roots; about 15 percent gravel and 5 percent cobbles; neutral (pH 6.8); clear wavy boundary.

Bw2-12 to 17 inches; yellowish brown (10YR 5/4) very gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common very fine roots; about 40 percent gravel and 15 percent cobbles; neutral (pH 6.6); gradual wavy boundary.

Bw3-17 to 25 inches; yellowish brown (10YR 5/4) very gravelly loamy coarse sand, dark yellowish brown (10YR 3/4) moist; weak very fine subangular blocky structure; slightly hard, very friable; common very fine roots; about 35 percent gravel and 15 percent cobbles; neutral (pH 6.9); clear wavy boundary.

C-25 to 60 inches; variegated very gravelly coarse sand; single grain; loose; about 40 percent gravel and 10 percent cobbles; neutral (pH 6.9).

### Typical Pedon Location

Map unit in which located: Trude gravelly loam, 0 to 4 percent slopes

Location in survey area: About 2 miles south and 2 miles east of Island Park Siding (fig. 14), about 1,815 feet west and 1,350 feet north of the southeast corner of sec. 17, T. 12 N., R. 44 E.

**Range in Characteristics**

Reaction: Neutral or slightly acid throughout the profile
Base saturation: 30 to 50 percent

A horizon:
Value-4 to 6 dry, 2 or 3 moist
Content of coarse fragments-0 to 20 percent

Bw horizon:
Value-5 or 6 dry, 2 to 4 moist
Texture-gravelly loam, very gravelly coarse sandy loam, very gravelly loamy coarse sand, extremely gravelly loamy coarse sand
Content of coarse fragments-15 to 55 percent

C horizon:
Content of coarse fragments-35 to 60 percent

## Turnerville Series

Depth class: Very deep
Drainage class: Well drained
Position on landscape: Loess-covered foothills
Parent material: Weakly calcareous loess
Slope: 1 to 20 percent
Elevation: 5,600 to 6,300 feet
Average annual precipitation: 18 to 22 inches
Average annual air temperature: 35 to 41 degrees F
Frost-free period: 50 to 75 days

**Taxonomic class:** Fine-silty, mixed Typic Cryoboralfs

**Typical Pedon**

Oi-1 inch to 0; slightly decomposed needles, twigs, bark, and other plant remains.
A-0 to 5 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 3/4) moist; moderate fine granular structure; soft, very friable, nonsticky and slightly plastic; many very fine tubular pores; many very fine and fine roots; medium acid (pH 5.6); clear smooth boundary.
E-5 to 15 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine tubular pores; many very fine and fine roots; medium acid (pH 6.0); clear smooth boundary.
E/B-15 to 22 inches; light gray (10YR 7/2) and yellowish brown (10YR 5/4) silt loam, dark brown (10YR 4/3) and dark yellowish brown (10YR 3/4) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; common very fine and fine roots; medium acid (pH 6.0); clear wavy boundary.
Bt1-22 to 33 inches; brown (10YR 5/3) silt loam, dark yellowish brown (10YR 3/4) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; few very fine and fine roots; many moderately thick clay films on faces of peds and lining pores; uncoated silt grains on faces of peds; slightly acid (pH 6.2); abrupt smooth boundary.
Bt2-33 to 42 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; few very fine and fine roots; common thin clay films on faces of peds and lining pores; uncoated silt grains on faces of peds; slightly acid (pH 6.2); clear smooth boundary.
Bt3-42 to 54 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; few very fine roots; few thin clay films on faces of peds and lining pores; uncoated silt grains on faces of peds; slightly acid (pH 6.4); clear smooth boundary.
Bt4-54 to 63 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine tubular pores; few very fine roots; few thin clay films on faces of peds; slightly acid (pH 6.4).

**Typical Pedon Location**

Map unit in which located: Greys-Turnerville silt loams, 4 to 12 percent slopes
Location in survey area: About 8 miles east and 3 miles north of Marysville, about 50 feet west and 2,100 feet south of the northeast corner of sec. 16, T. 9 N., R. 44 E.

**Range in Characteristics**

Content of rock fragments: Commonly less than 3 percent
Other features: No A horizon in some pedons

E horizon:
Value-5 to 7 dry, 4 to 6 moist
Chroma-2 to 4 dry or moist
Reaction-medium acid to mildly alkaline

Bt horizon:
Value-5 or 6 dry, 4 or 5 moist

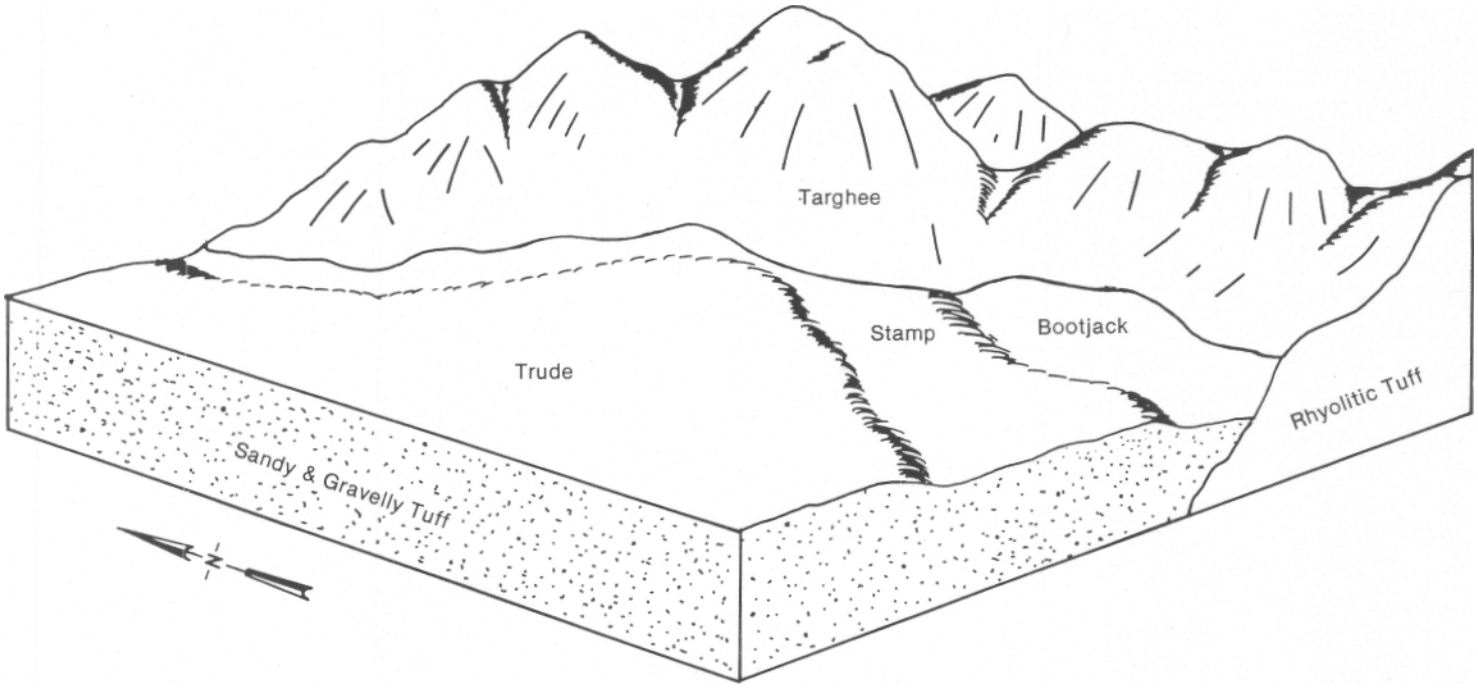


**Figure 14.-Typical pattern of Trude and associated soils in Island Park, near Trude Siding.**

Chroma-2 to 4 dry or moist
Texture-silt loam, silty clay loam
Content of clay-18 to 30 percent
Reaction-medium acid to mildly alkaline

**Vadnais Series**

Depth class: Moderately deep
Drainage class: Well drained
Position on landscape: Basalt plains, hillsides
Parent material: Loess, valley side alluvium
Slope: 1 to 50 percent
Elevation: 5,300 to 6,600 feet
Average annual precipitation: 18 to 26 inches
Average annual air temperature: 37 to 41 degrees F
Frost-free period: 40 to 80 days
**Taxonomic class:** Fine-loamy, mixed Argic Pachic Cryoborolls

**Typical Pedon**

A1-0 to 2 inches; dark brown (10YR 3/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine tubular pores; medium acid (pH 5.6); clear wavy boundary.

A2-2 to 8 inches; dark brown (10YR 3/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few coarse roots; common very fine tubular pores; medium acid (pH 5.7); clear wavy boundary.

Bt1-8 to 14 inches; dark yellowish brown (10YR 4/4) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few coarse roots; common very fine tubular pores; common thin clay films on faces of peds and lining pores; about 5 percent subangular basalt gravel; medium acid (pH 5.8); clear wavy boundary.

Bt2-14 to 28 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 3/3) moist; moderate fine prismatic structure; hard, firm, sticky and plastic; common very fine roots; common very fine pores; many thin clay films on faces of peds and lining pores; about 5 percent subangular basalt gravel; medium acid (pH 5.8); clear wavy boundary.

Bt3-28 to 36 inches; yellowish brown (10YR 5/4) cobbly silty clay loam, dark brown (10YR 4/3) moist; moderate fine prismatic structure parting to strong

medium and fine subangular blocky; hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; about 20 percent angular basalt cobbles; medium acid (pH 5.9); abrupt wavy boundary.

2R-36 inches; vesicular basalt.

### Typical Pedon Location

Map unit in which located: Katseanes-Rock outcrop-Vadnais complex, 1 to 12 percent slopes

Location in survey area: About 4 miles west of the headquarters of the Sand Creek Wildlife Management Area, about 1,600 feet west and 1,180 feet south of the northeast corner of sec. 11, T. 10 N., R. 40 E.

### Range in Characteristics

Depth to bedrock: 20 to 40 inches

Thickness of the mollic epipedon: 17 to 38 inches

Reaction: Medium acid or slightly acid throughout the profile

A horizon:

Hue-7.5YR or 10YR
Value-3 or 4 dry, 2 or 3 moist
Chroma-3 to 5 dry, 2 or 3 moist
Content of coarse fragments-0 to 5 percent

Bt horizon:

Hue-5YR to 10YR
Value-4 to 6 dry, 3 or 4 moist
Chroma-3 or 4 dry, 2 to 6 moist
Texture-silt loam, silty clay loam, sandy clay, clay, cobbly silty clay loam, gravelly clay

## Wolverine Series

Depth class: Deep or very deep

Drainage class: Excessively drained

Position on landscape: Basalt plains

Parent material: Eolian deposits

Slope: 1 to 30 percent

Elevation: 4,750 to 5,200 feet

Average annual precipitation: 10 to 13 inches

Average annual air temperature: 38 to 43 degrees F

Frost-free period: 90 to 100 days

**Taxonomic class:** Mixed, frigid Xeric Torripsamments

### Typical Pedon

A-0 to 6 inches; brown (10YR 5/3) fine sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; many very fine and fine roots; slightly effervescent; mildly alkaline (pH 7.6); clear smooth boundary.

AC-6 to 15 inches; brown (10YR 5/3) fine sand, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable; common fine roots; slightly effervescent; mildly alkaline (pH 7.8); gradual smooth boundary.

C1-15 to 26 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grain; loose; few fine roots; slightly effervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C2-26 to 53 inches; pale brown (10YR 6/3) sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few fine roots; slightly effervescent; moderately alkaline (pH 8.2); abrupt irregular boundary.

C3-53 to 59 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; massive; soft, very friable; few fine roots; slightly effervescent; moderately alkaline (pH 8.2); abrupt irregular boundary.

C4-59 to 60 inches; pale brown (10YR 6/3) sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few fine roots; slightly effervescent; moderately alkaline (pH 8.2).

### Typical Pedon Location

Map unit in which located: Wolverine fine sand, 4 to 15 percent slopes

Location in survey area: About 8 miles west and 2 miles south of Parker, about 70 feet east and 2,100 feet north of the southwest corner of sec. 7, T. 7 N., R. 39 E.

### Range in Characteristics

Depth to bedrock: 40 to more than 60 inches

Reaction: Neutral to moderately alkaline throughout the profile

A horizon:

Value-5 or 6 dry, 3 or 4 moist

C horizon:

Value-5 or 6 dry, 3 to 5 moist
Chroma-2 or 3 dry or moist
Texture-fine sand, sand

# Formation of the Soils

Soil is the unconsolidated mineral and organic material on the earth's surface that supports plants. The kind of soil is influenced by the parent material, climate, living organisms, relief, and time.

Soils vary in their horizonation, color, texture, structure, and certain chemical properties. These characteristics are key to determining how the soils formed.

**Parent Material**

The soils in the survey area formed in alluvial, eolian, glacial, and residual parent material. Alluvium is the dominant parent material on the outwash plains along the Falls River, the Henrys Fork of the Snake River, and the Teton River. The soils in these areas are primarily those of the St. Anthony, Allwit, and Labenzo series (fig. 15). Downstream from the community of St. Anthony, the alluvium is derived from basalt, quartzite derivatives, sandstone, and rhyolitic tuff. Upstream from St. Anthony, the coarse fragments are of the same mineralogy, but the percentage of basalt cobbles and stones is higher.

Side slope alluvium deposited during periods of spring runoff and severe rainstorms has affected the hilly soils of the basalt plains and the deep loessial soils in the survey area. West and north of St. Anthony, soil material is washed downslope from pressure ridges into closed basins. East of St. Anthony and Ashton, slopes are long enough for a considerable amount of soil movement to occur as a result of snowmelt and rainfall.

The parent material of many of the soils in the Island Park-Henrys Lake area was deposited by melting glaciers. These soils include those of the Raynoldson, Fourme, Bootjack, Sudpeak, Sawtelpeak, Chickreek, Stamp, and Trude series. Much of the material was deposited by meltwater from the Centennial and Henrys Lake Mountains. The parent material of the soils in the Trude Siding and Shotgun Valley was deposited at about the same time by the same method. Similar deposits surround Henrys Lake.

The poorly drained soils in the Island Park area consist of silty alluvium over sand and gravel. These soils include those of the Bootjack, Henryslake, Chickreek, Stamp, and Sawtelpeak series. The silty alluvium in the Chickreek soils has a high percentage of diatomaceous earth in the upper part. It was washed from the Henrys Lake area, where a larger prehistoric lake provided suitable habitat for single-celled diatoms, a freshwater algae (17).

The sandy soils and the sand dunes west and north of St. Anthony originally were deposited as alluvium by glacial meltwater. Most of the sand is derived from the watershed of the Henrys Fork of the Snake River (6).

The soils closest to the dunes do not have a subsoil and exhibit little evidence of profile development. Examples are soils of the Wolverine, Juniperbute, and Grassyridge series. These soils have been in place and have supported vegetation for only a short period and have developed only a weak surface layer. The soils farther away from the dunes have been in place long enough for the formation of a subsoil of sandy loam or loam within a depth of 40 inches. Examples are soils of the Blacknoll, Jipper, and Stipe series.

Scattered deposits of eolian material that contains lime are on the basalt plains in the survey area. This material consists of deposits from the bottom of old Mud Lake, which is southwest of the survey area. The position of these soils depends on the shape of the surface, the aspect of the slope, and the vertical relief of the basalt knolls. Examples of soils that formed in this material include those of the Stipe and Blacknoll series.

Another type of wind-deposited material in the survey area is made up of silt- and clay-sized particles. This material generally was deposited farther from its source than the sandy material. Most of the soils east of the Henrys Fork of the Snake River and those in a large area north of the dunes formed in this loess. It is thought that this material originated from the upper Snake River Plains. The dominant soils are those of the Rexburg, Ririe, Kucera, Rin, Vadnais, and Hagenbarth series. This material is underlain by rhyolite in the eastern part of the survey area and by basalt in the northern part. The soils in the western part of the Shotgun Valley also formed in loess. Spliten and

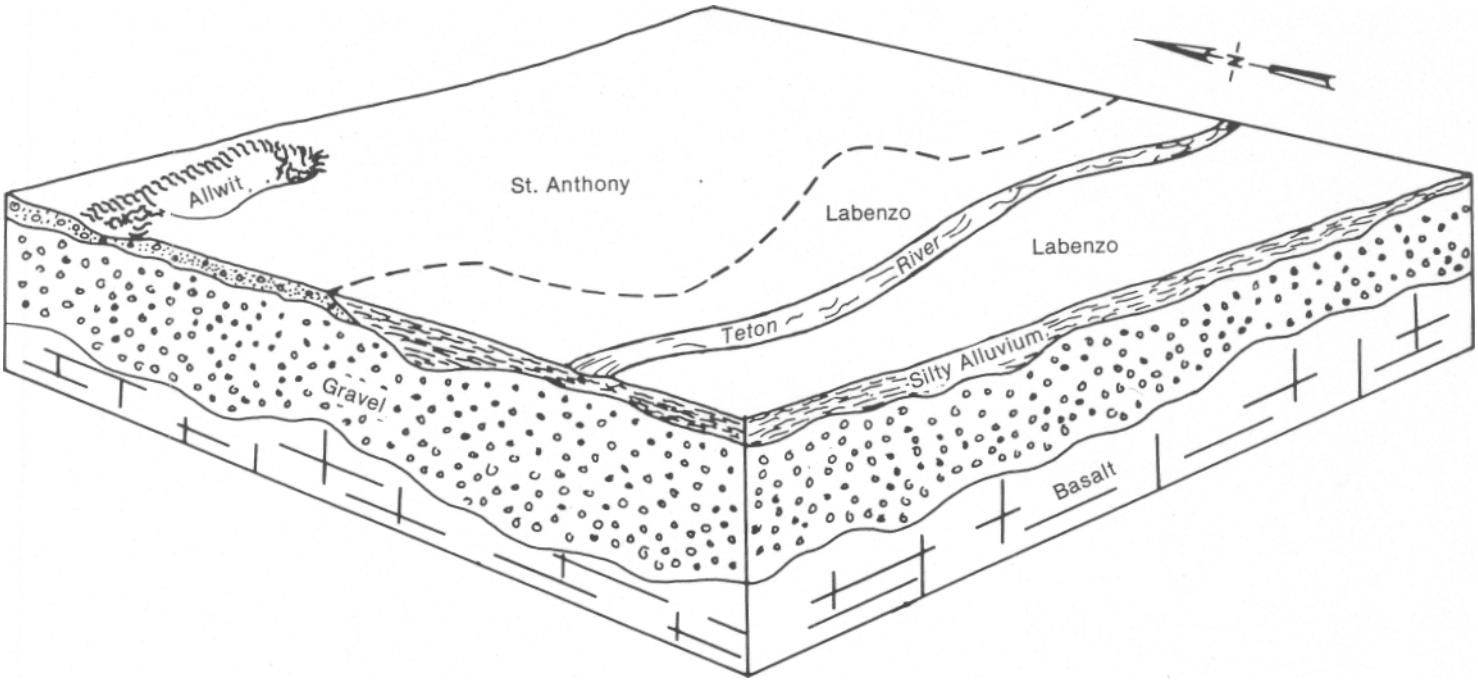


**Figure 15.-Typical pattern of soils that formed in alluvium.**

Shotgun soils are dominant in this area. Almost all of the soils in the survey area have been influenced by windblown deposits.

In the Greentimber area, east of Ashton and Marysville, the soils are primarily of glacial origin. Evidence indicates that ice has had a tremendous impact on the landforms and soils in this area. The key indicators of glacial scouring and deposition are isolated boulders in areas of drainageways and broad ridges, closed basins that tend to stay wet in summer, and rock fragments that occur in a random pattern. Deposits of glacial drift more than 5 feet thick are in this area. The lowest elevation at which the drift is found is 5,200 feet. At this elevation, however, the drift is primarily in isolated pockets and drainageways. Two convex deposits that appear to be terminal moraines are at the lower end of the valley, at an elevation of about 5,250 feet. Soils that have glacial drift to a depth of 5 feet or more and have some loess include those of the Greentimber, Robinlee, Marystown, and Marotz series.

The surface of many soils east of St. Anthony and south of the Falls River has gravel that appears to be of glacial origin. East of Squirrel are small deposits of gravel that appear to have originated from the mountains to the east. Farther south, in the Hog Hollow area, small pebbles are on the surface and there is some evidence that kettles and kames have formed.

In the Drummond-Lamont area, the landscape is steeper and has pronounced drainageways and sharper ridges. The glacial drift in this area has been cut and shaped by ice and then covered by loess. Examples of soils in this area include those of the Tetonia, Lantonia, and Rin series.

Residual soils are those that formed in material that has remained in place. The forested Judkins and Targhee soils in the northern part of the survey area formed under wet climatic conditions and in residual material that varies in hardness. These soils are in such areas as the side slopes of the Island Park Caldera. They have some loess and slope alluvium.

## Climate

Annual precipitation and seasonal temperatures greatly influence soil formation. The weathering of parent material, the kind of vegetation, and the movement of soil are all affected by the wind, temperature, and precipitation. The climate in the survey area is very cold and moist from September through March. In spring it is wet and somewhat warmer. Summers are dry in most years, and temperatures range from below freezing to more than 90 degrees. The windiest periods of the year are spring and fall.

The southwestern part of the survey area is the driest and warmest. The average annual precipitation is

about 11 inches, and the average annual temperature is about 42 degrees F. The wettest and coldest area is in the mountains of the northeastern part of the survey area. The average annual precipitation at the Island Park Dam is 30 inches, and the average annual temperature is about 37 degrees F.

The windiest area is in the southwestern part of the survey area. Air currents moving in a northeasterly direction on the upper Snake River Plains are routed through the survey area by the mountains. The open basalt plains and alluvial outwash plains south and west of the Island Park Caldera offer little resistance to these winds. Examples of soils that are subject to wind erosion in this area include those of the Malm, Diston, Grassyridge, Modkin, Wolverine, and Jipper series.

In the drier part of the survey area, calcium carbonate has not been leached out of the soils. Malm, Diston, Grassyridge, and Blacknoll soils have calcium carbonate at the surface or within a depth of 6 inches. In the 15- to 18-inch precipitation zone near St. Anthony and Ashton, calcium carbonate has been leached to a depth of 10 to 30 inches or more. Rexburg, Ririe, Kucera, and Lostine soils are in this area. Soils that receive more than 18 inches of precipitation, such as those of the Greys, Robinlee, Turnerville, Fourme, Kitchell, and Targhee series, generally are free of calcium carbonate unless they are on southwest-facing slopes or formed in limestone residuum.

Some soil properties are highly influenced by climate. These include texture, structure, organic matter content, clay content, and permeability. The microbial activity in the soils also is influenced by climate.

Soil texture tends to be finer in areas of higher precipitation. A more rapid decomposition of parent material and translocation of clay into the lower layers can result in a layer of clay accumulation. The higher amounts of clay result in a strong blocky structure and slower permeability. Because biological activity is greater in areas of higher precipitation, the organic matter content also is higher.

Cooler temperatures tend to slow down soil formation. At the higher elevations where the growing season is only 50 to 70 days, biological activity is restricted to only a few months of the year. Many of these areas are forested and have slopes of 10 percent or more. Soils such as those of the Targhee and Judkins series are in these areas.

The soils in the open areas of the Shotgun Valley and Henrys Lake Flat have more clay than those in the surrounding mountains. The broad, nearly level valley floors allow for more infiltration of spring meltwater. Consequently, more clay particles move downward through these soils. Sudpeak, Shotgun, and Fourme soils are examples of cold, wet soils on broad valley floors.

**Living Organisms**

Plants and animals have a tremendous impact on soil formation. Organic matter content, acidity, and bulk density are the soil characteristics that are most readily influenced by the kinds of plants and animals.

The soils on the plains in the survey area dominantly support sagebrush and grass. These soils are divided into two precipitation zones. Those that receive less than about 15 inches of annual precipitation generally exhibit less evidence of profile development because of a limited amount of natural vegetation. These soils are characterized by a low organic matter content, alkaline reaction, a high rate of permeability, and very little profile development. They are dark because of their parent material rather than their organic matter content. Temperatures are quite high in summer, and moisture is not available to plants for extended periods. Examples of soils that receive less than 15 inches of annual precipitation are those of the Jipper, Stipe, Nayrib, and Snowshoe series.

Soils on the plains that receive more than 15 inches of annual precipitation are characterized by more profile development than those that receive less than 15 inches. The organic matter content is higher, the subsoil is more developed, the available water capacity is higher, and the production of vegetation is higher. Most of the crops in the survey area are grown on these soils. Also, wildlife are most abundant on these soils. The dominant soils in these areas are those of the Rexburg, Ririe, Rin, Kucera, Lostine, Vadnais, Katseanes, Hagenbarth, and Tetonia series.

Forested soils generally are well developed in the lower part. Because of the leaching that occurs at these higher elevations, where snow depths are more than 4 feet in most years, clay is at a depth of 40 inches or more and the surface layer is light colored. Tree roots enable water to penetrate the surface and thus to carry clay, silt, and organic matter to the lower part of the profile. Turnerville, Booneville, Greys, and Judkins soils are examples of forested soils that have a well developed profile.

Living organisms that contribute to soil formation include microbes, plants, rodents, insects, and worms. All of these require moisture and specific temperatures. The soils in the survey area that contain the most living organisms are those of the Allwit, Tepete, Bootjack, Chickreek, and Stamp series and Fluvaquents. Although

these soils have an abundance of living organisms, they generally are not used for crops because of a high water table and cold temperatures.

Plants and animals tend to mix soil layers and contribute organic matter to the soil. Increased mixing results in a soil that has fewer horizons than those that are subject to very little activity. Soils on plains, such as those of the Lostine, Kucera, Rexburg, Greentimber, Marystown, St. Anthony, and Jipper series, are subject to more mixing and have more organic matter from living organisms than soils in forested areas, such as those of the Booneville, Judkins, Turnerville, and Greys series.

**Relief**

Relief influences soil formation primarily through its effect on runoff. The steeper slopes allow water to run off the surface rather than seep into the soil. Water is needed to support the vegetation necessary to form a deep topsoil. Conversely, the soils that formed in swales have more water and thus support more vegetation and have a thick topsoil (9).

The poorly drained soils in this survey area support the greatest amount of vegetation. Those in areas at the lower elevations on the alluvial plains along the Henrys Fork of the Snake River support cattails and water-tolerant grasses. Allwit soils are the dominant soils in these areas. Very little organic matter builds up in areas of the sandy Eginbench soils. These soils are used for crops, but do not support a permanent plant cover. Crop residue is the main source of the organic matter in the surface layer.

Other wet soils are in the Island Park-Henrys Lake area. Bootjack, Chickreek, and Stamp soils have a high content of organic matter, are slowly permeable near the surface, and have low bulk density. They formed under water-tolerant grasses and have a dark surface layer. Sawtelpeak soils on the Henrys Lake Flat and Henryslake soils in the Shotgun Valley formed under wet, cold conditions. They support sedges and other grasses and have a dark surface layer. Tepete peat, which consists of decomposing layers of water-tolerant grasses, forbs, and shrubs, is on the wet shoreline of Henrys Lake.

Very few soils in the survey area are characterized by strong relief. The soils in the mountainous areas around the northern and eastern edges of the survey area have the strongest relief. Examples of these soils are those of the Wolverine, Juniperbute, Lionhead, and Targhee series. The soils that are used for crops are nearly level to hilly. Relief is less pronounced on the alluvial soils near St. Anthony than on the deep soils that formed in loess near Drummond, Lamont, and Squirrel.

**Time**

The most constant factor in soil formation is time. The soils in the survey area have been forming and changing since the Precambrian era. The metamorphic rock in the Henryslake and Centennial Mountains west and north of Henrys Lake is the oldest formation in the survey area. It is about 4 billion years old (8). The dominant soils in these areas are those of the Lionhead series.

Most of the soils in the survey area have been forming for about 20,000 years, or since the glaciers receded (20). The age of a soil is related to the degree of development in the various layers.

The youngest soils in the survey area are near the active dunes west of St. Anthony. They have supported vegetation long enough to have developed a surface layer that has a small amount of organic matter. Wolverine, Juniperbute, and Eginbench are examples of soils that exhibit very little evidence of profile development. The active dunes have been moving since postglacial times and are still moving at a rate of 4 to 25 feet per year (6). The distinct chains of dunes suggest that they have developed from glacial outwash deposited toward the end of each glacial era of the Ice Age.

Soils that have a weakly developed subsoil are considered to be older than the dunelike soils but younger than most of the soils on mountains and foothills. These weakly developed soils include those of the Malm, Diston, Modkin, and Grassyridge series. They receive very little moisture. As a result, the soil-forming process is retarded.

Most of the soils in the survey area have formed a well developed subsoil during the last 20,000 years. The soils near St. Anthony that are used for crops, dominantly St. Anthony and Allwit soils, have been in place since the postglacial meltwater settled into the channel of the Henrys Fork of the Snake River. The nearby Eginbench soils are much younger and exhibit little evidence of profile development.

The soils on the basalt plains formed under wetter conditions than the St. Anthony soils and have been in place long enough for the formation of a well developed subsoil. These soils include those of the Jipper, Stipe, and Nayrib series. Rexburg, Ririe, Kucera, and Lostine soils are about the same age, but they formed in deep loess east of St. Anthony and Ashton.

The older soils in the central and eastern parts of the

survey area have a high content of clay in the subsoil, are slowly permeable, and have a high organic matter content. They are at the higher elevations on the basalt plains, on loessial plains, and in some forested areas. Examples are Vadnais, Hagenbarth, and Katseanes

soils in areas used as range and Rin, Robinlee, and Greentimber soils in areas used for crops. Greys, Turnerville, and Judkins soils, which are forested, have a well developed subsoil and appear to be quite old.

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# Glossary

**Alluvial fan.** The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Animal-unit-month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

| | |
|---|---|
| Very low | 0 to 2.5 |
| Low | 2.5 to 3.75 |
| Moderate | 3.75 to 5.0 |
| High | 5.0 to 7.5 |
| Very high | more than 7.5 |

**Barchan dune.** A crescent-shaped dune that has tips that extend leeward. The leeward side of the dune is concave, and the windward side is convex.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Blowout.** A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Brush management.** Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases forage production and thus reduces the hazard of erosion. Brush management can improve the habitat for some species of wildlife.

**Butte.** An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Caldera.** Large, basin-shaped volcanic depressions that are generally circular. The diameter of the depression is many times greater than that of the vent, regardless of the steepness of the walls.

**Canopy.** The leafy crown of trees or shrubs. (See Crown.)

**Canyon.** A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Coarse fragments.** Mineral or rock particles larger than 2 millimeters in diameter.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in

diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

**Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

*Loose*.-Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*-When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*-When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*-Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*-Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*-When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft*.-When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*-Hard; little affected by moistening.

**Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Corrosive.** High risk of corrosion to uncoated steel or deterioration of concrete.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

**Cropping system.** Growing crops according to a planned system of rotation and management practices.

**Cross-slope farming.** Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

**Crown.** The upper part of a tree or shrub, including the living branches and their foliage.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Deep soil.** Restrictive feature at a depth of 40 to 60 inches in the profile.

**Deferred grazing.** Postponing grazing or arresting grazing for a prescribed period.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*-These soils have very high and high hydraulic conductivity and a low waterholding capacity. They are not suited to crop production unless irrigated.

*Somewhat excessively drained.*-These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of

crops can be grown and yields are low.

*Well drained.*-These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

*Moderately well drained.*-These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

*Somewhat poorly drained.*-These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

*Poorly drained.*-These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

*Very poorly drained.*-These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Draw.** A small stream valley, generally more open and with broader bottom land than a ravine or gulch.

**Duff.** A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep. *Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion. *Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

**Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fan terrace.** A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

**Fast intake** (in tables). The rapid movement of water into the soil.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

**Fine textured soil.** Sandy clay, silty clay, or clay.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Foothill.** A steeply sloping upland that has relief of as much as 1,000 feet (or 300 meters) and fringes a mountain range or high-plateau escarpment.

**Foot slope.** The inclined surface at the base of a hill.

**Forb.** Any herbaceous plant not a grass or a sedge.

**Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Glacial drift** (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

**Glacial outwash** (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

**Glacial till** (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

**Green manure crop** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water** (geology). Water filling all the unblocked pores of underlying material below the water table.

**Growing season.** The number of days from the average date of the last killing frost in spring to that of the first killing frost in fall. A growing season of 70 to 100 frost-free days is considered to be short, and one of less than 70 frost-free days is considered to be very short.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Hard rock.** Rock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

**High-residue crops.** Crops such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

*O horizon.*-An organic layer of fresh and decaying plant residue.

*A horizon.*-The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*E horizon.*-The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*-The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*C horizon*.-The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying *soil* material. The material of a C horizon may be either like or

unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*-Soft, consolidated bedrock beneath the soil.

*R layer*.-Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:

*Controlled flooding*.-Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

*Drip (or trickle*).-Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

*Furrow.*-Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*-Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation*.-Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

**Kame** (geology). An irregular, short ridge or hill of stratified glacial drift.

**Kettle** (geology). A steep-sided, bowl-shaped depression in glacial drift deposits that does not have surface drainage. It is believed to have formed by the melting of a large, detached block of stagnant ice buried in the glacial drift.

**Knoll.** A small, low, rounded hill rising above adjacent landforms.

**Lacustrine deposit** (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**Light textured** soil. Sand or loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by wind.

**Low-residue crops.** Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Medium textured** soil. *Very* fine sandy loam, loam, silt loam, or silt.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no

natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately deep soil.** Restrictive feature is at a depth of 20 to 40 inches in the profile.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance-few, *common,* and *many; size-fine, medium,* and *coarse;* and contrast-faint, *distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

**Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

**Munsell notation.** A designation of color by degrees of three simple variables-hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Outwash plain.** A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

**Oxbow.** A linear, semicircular, depressional channel carved by a meandering stream.

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly** (in tables). The slow movement of water through the soil, adversely affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

| | |
|---|---|
| Very slow | less than 0.06 inch |
| Slow | 0.06 to 0.2 inch |
| Moderately slow | 0.2 to 0.6 inch |
| Moderate | 0.6 inch to 2.0 inches |
| Moderately rapid | 2.0 to 6.0 inches |
| Rapid | 6.0 to 20 inches |
| Very rapid | more than 20 inches |

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Pleistocene.** Period of time extending from present to 2 million years ago.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Poor filter** (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

**Potential native plant community.** The plant

community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

**Pressure ridge.** An elongated ridge of basalt that forms when a flow slows down and cools.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

| | |
|---|---|
| Extremely acid | below 4.5 |
| Very strongly acid | 4.5 to 5.0 |
| Strongly acid | 5.1 to 5.5 |
| Medium acid | 5.6 to 6.0 |
| Slightly acid | 6.1 to 6.5 |
| Neutral | 6.6 to 7.3 |
| Mildly alkaline | 7.4 to 7.8 |
| Moderately alkaline | 7.9 to 8.4 |
| Strongly alkaline | 8.5 to 9.0 |
| *Very* strongly alkaline | 9.1 and higher |

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from ground water.

**Salty water** (in tables). Water that is too salty for consumption by livestock.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Seepage** (in tables). The movement of water through

the soil. Seepage adversely affects the specified use.

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shallow soil.** Restrictive feature at a depth of 10 to 20 inches in the profile.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

**Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

| | |
|---|---|
| Nearly level | 0 to 2 percent |
| Gently sloping | 2 to 4 percent |
| Moderately sloping | 4 to 8 percent |
| Strongly sloping | 8 to 12 percent |
| Moderately steep | 12 to 20 percent |
| Steep | 20 to 30 percent |
| Very steep | 30 percent and higher |

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Slow intake** (in tables). The slow movement of water into the soil.

**Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

| | |
|---|---|
| Very coarse sand | 2.0 to 1.0 |
| Coarse sand | 1.0 to 0.5 |
| Medium sand | 0.5 to 0.25 |
| Fine sand | 0.25 to 0.10 |
| Very fine sand | 0.10 to 0.05 |
| Silt | 0.05 to 0.002 |
| Clay | less than 0.002 |

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

**Stony**. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure *are-platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of

the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

**Summer fallow.** The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Talus.** Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep, rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in *ways* too small to be of consequence in interpreting their use and behavior.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). Otherwise suitable soil material too thin for the specified use.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toe slope.** The outermost inclined surface at the base of a hill; part of a foot slope.

**Too arid** (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

**Tuff.** A compacted deposit that is 50 percent or more volcanic ash and dust.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Variegation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Very deep soil.** Restrictive feature at a depth of 60 inches or more in the profile.

**Very shallow soil.** Restrictive feature at a depth of 10 inches or less in the profile.

**Watershed.** Land and water within the confines of a connected network of drainageways.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The action of uprooting and tipping over trees by the wind.